

# Psychological Bulletin

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## GERMAN INDUSTRIAL PSYCHOLOGY IN THE FIFTH YEAR OF WAR

H. L. ANSBACHER

*Office of War Information, London*

This survey of industrial psychology in Germany in the fifth year of war may leave the reader with an unexpectedly favorable impression of the German scene. He may first be surprised to learn that such basic work is still being carried on. To this one must answer that if the chaotic state of Germany were such that quiet basic work were no longer possible, German resistance would be much weaker than it is. Secondly, the reader may be surprised to learn that compulsion is not the only force behind the German war effort. But at this point it may be said that there has always been an inclination on our part to see only the terror aspect of Nazism. A strong morale could never have been built with avoidance of punishment the only motive. Actually, in addition to terror, reward has always been used by the Nazis in the form of social legislation and welfare institutions and in efforts to give the common man opportunities for advancement. The material along these lines, presented below, also affords a glimpse into the difficulties arising from the general atmosphere of compulsion. For example, the importance of tactfulness in dealing with the worker is repeatedly stressed, indicating, as one might expect, that tactfulness is often wanting.

Mention of the material for this survey and its limitations should be made here. Although all sources but one (4) are newspaper accounts, they contain sufficient substantial material to warrant presentation in this journal. Since no other sources are available, the only alternative would have been to communicate no information at all to the American psychologist regarding this recent aspect of applied psychology. As to the extent of application of the various measures, there is no reason to doubt that they are applied at least in the specific instances described below, and that there is an official desire to see them applied even more widely. This was indicated by an apparent propaganda campaign on the subject during February and March, 1944. Fifteen of our 20 original references are from this period, and additional newspaper accounts were found, including one illustrated motion and time study. Probably the entire German press carried similar articles at that time.

### *I. Manpower engineers (MPEs).*

Germany in the 5th year of war is confronted with a tremendous and progressive manpower shortage, in the face of which it becomes ever more urgent to mobilize the last reserves of production capacity. This mobilization was officially organized in October, 1943, by the Reich Minister for Armaments and War Production, Speer, through the appointment of engineer Gotthard Friedrich to the newly created office of Reich Manpower Engineer (Reichs-Arbeitseinsatzingenieur). He is assisted by 34 regional manpower engineers (MPEs) directing the efforts of 5000 plant MPEs who are nominated by the individual managements from among their personnel and are confirmed by the government. Initially only plants with over 300 workers were to have MPEs, appointments to be made for smaller plants as well, should the plan prove successful.

The task of the MPE is to examine where manpower can be spared without impairing production, and to increase the output of the remaining workers so that 9 men will do the work of 10 (22). To accomplish this end great powers have been delegated to the MPE. He can give orders on all questions pertaining to his task. For his decisions he uses the recommendations of the plant physician, psychologist and motion-and-time study man. According to Speer's proclamation the MPE has to carry out his task "free and independent of plant interests, solely with regard to the most economical means of manpower utilization." He thus is called "the conscience of the plant." Apparently this interference with the regular management did meet with certain resistance judging by a mention of a recent meeting of MPEs of the chemical industry (22). There we find that many difficulties were encountered from the inception of the program, and that although it met with criticism in the beginning, it has since become an integral part of German industry.

The institution of MPEs is the outward expression and final coordination of great efforts to increase industrial efficiency through all known methods of industrial psychology and motion and time study, in many of which Germany is only now catching up with America.

### *II. Employee testing.*

"The manpower shortage has brought the problem of industrial psychology again to the fore. Especially the larger industries are using aptitude testing in an attempt to place all their present workers where they can function with the greatest efficiency" (18).

The problems and methods of employee testing are presented in an article by Bornemann (4) in a journal of the German steel industry on which the remainder of this section will be based. Employee testing

is seen to fall into 3 developmental steps: (1) psychotechnical tests, (2) appraisal of personality and (3) aptitude in relation to vocational demands.

1. *Psychotechnical tests.* These are concerned with: intelligence and mechanical comprehension; manual ability; and willpower, attention and memory, the latter as an important auxiliary function. After about 25 years of research and practical experience, the development of these tests is considered completed. The following are the problems of the present:

a. Existing methods must be systematized and synthesized. To this end the Reich Labor Ministry has devised a standard series of tests to be adopted after the war by all German vocational guidance bureaus.

b. It must be realized that tactfulness is required to enlist the cooperation of the testee.

c. Tests for the many foreign workers must be devised with the view to finding those who can be trained to do skilled work. The Institute of Industrial Psychology and Education (Institut für Arbeitspsychologie und -pädagogik) of the German Labor Front has worked out a method suitable for group procedure (12).

d. Written trade knowledge tests had to be developed to facilitate the work of the MPE, and for these the fill-in type of question was used (5). The written tests are supplemented by job performance tests.

2. *Characterological examination.* This is of great importance because by far the larger number of complaints of supervisors relate to personality factors. Characterological appraisal takes the lines of German military psychology (2), and consists of: expression analysis, life history, thought analysis (Geistesforschung), and action analysis. A new book by Simoneit (14) is referred to in this connection, from which it would appear that since the curtailment of military psychology (1), Simoneit has been devoting himself to industrial psychology.

In *thought analysis*, the examinee may be asked to write within a stated time a brief essay on "What would happen if the sea level would drop 300 meters?" or on "... if there were no clocks and watches?" The results are rated for ability to think, richness of thought and training of thought. Values and attitudes are tested by the picture preference and description test (13), where the testee is asked to give the reasons for his preference in writing. *Will and action analysis* includes the command series and the leadership test. In the first the testee, as one of a group of four, is ordered to execute certain physical actions under stress, from which ability to concentrate, perseverance, will-power, bodily agility, cooperation and other traits can be observed. In the second, the testee is asked to lecture to a group of 6 to 8 on a theme chosen by himself, or to lead their discussion, as a measure of his ability to assert himself mentally and through his personality. *Expression analysis* is incidental to these situations.

The important difference from military psychology is that whereas in military psychology the group judgment of several psychologists was required, here apparently one psychologist's judgment is accepted, thereby greatly reducing the validity of such qualitative procedure. Bornemann mentions that the method makes great demands on the skill of the psychologist, but that a sufficient supply of adequately trained people is assured for the future through the newly-created and broadened training facilities leading to the degree of *Diplome Psychologist* (see 1).

3. *Psychological job analysis.* Today's main task is to determine which particular aptitudes can better be dispensed with in one job than in another. An important basis for meeting this task is provided in the job analyses of the Reich Institute for Vocational Training in Commerce and Industry (*Reichsinstitut für Berufsausbildung in Handel und Gewerbe*) the publication of which began in 1938 and will eventually include all vocations. From these comparative job analysis tables can be developed, listing in the left-hand column the various jobs of an industry, and across the top 28 psychological traits grouped under the headings of motivation, intelligence, willpower and character, special intelligence patterns, motor ability and sundries. For each job the requirement of each trait is entered in ratings of a seven-point scale. If a certain job is to be filled, one needs to test only those traits for which the requirements are high.

At this point Bornemann raises the question: "To what extent does the aptitude of the German people as a whole meet the job requirements?" In reply, he refers to studies not yet published which seem to indicate an oversupply of practical-manual aptitude and a not inconsiderable shortage of theoretical-intellectual ability. This is seen as a limitation to further technological development, quite apart from technological difficulties. It is a surprising finding to us, since formerly the Germans were known as good theoreticians, and no such shortage has been reported from other nations. Could it be the result of ten years of the Nazi educational system, openly anti-intellectual as it is?

The selection program is validated by follow-up reports. For this purpose a questionnaire, which corresponds to the job analysis chart, is filled in by the supervisor at regular intervals.

Industrial merit rating is also advocated by Steinwarz (15), director of the Bureau for Increasing Efficiency, Vocational Education and Management (*Amt für Leistungsertüchtigung, Berufserziehung und Betriebsführung*) of the German Labor Front, as a method in its own right for proper industrial placement. This bureau has been instrumental in developing standardized rating sheets for use by supervisors, which have already been introduced in several industries.

### III. Rationalization of industry.

1. *Motion and time study.* Motion and time study in Germany goes back to the inflation years when the metal industry was seeking a yard stick for job performance independent of fluctuating monetary values (3). It is known as the Refa method, Refa being an abbreviation for Reichsausschuss für Arbeitsstudien (Reich Committee for Work Studies).

Since 1935, the Refa, working in close cooperation with the German Labor Front, has trained 50,000 "time takers" (Refa-men). Refa training courses are taken by employees from the various industries, the qualifications for admission being (1) good character, (2) sound ideology, (3) understanding of managerial and leadership problems, and (4) vocational knowledge and ability. The curriculum includes (1) flow of work, (2) determination and utilization of skills, (3) Refa-timing, (4) work study, (5) time study and its uses, (6) just wages, (7) time study methods (11). The Refa-man also receives general psychological training.

With the present program of rationalization, the Refa receives particular stress. Its results in office work (21, 11), in furniture and affiliated industries (24), and in the textile industry (23) are described. Also its advantages in determining just wages are pointed out (3). One of its main functions appears to be to breakdown the jobs formerly done by skilled workers into a number of simple manipulations which can be taught quickly to unskilled and foreign labor (20, 24). Skilled labor is assured that this will not jeopardize their position after the war (20).

In view of the unpopularity of Taylorism, especially in Europe, it is emphasized that the Refa method is better and more humane than American or Russian methods to gear labor to mass-production (3). German rationalization of industry is a close approximation to organic life and creates "the living and healthy German plant which is capable of freeing the vital forces of the German through ever higher deeds of production," thus greatly increasing job satisfaction (6).

2. *Industrial suggestion system.* This system (Vorschlagswesen) was inaugurated in 1941 to increase efficiency by utilizing the inventiveness of every worker. In 1941, 3,000 plants participated and furnished 50,000 suggestions of which 25% were found useful. By 1943, 35,000 plants participated with 300,000 suggestions of which 60-70% were useful. The originators of useful suggestions receive honors and small rewards. Whereas in large plants only 5% of the workers participated, in small plants sometimes over 50% took part when the system was encouraged out of realization of its usefulness to labor management. Thus, it was concluded that the suggestion system should be accompanied by some general guidance (10), and accordingly, a comprehensive guided sugges-

tion system is now being launched by the German Labor Front through the Bureau mentioned above. For such a system the following considerations have been made.

Guidance should be entrusted to an invention councilor (Erfinderberater), with one councilor for each 600 workers. He should present to the workers specific problems raised by the central organization, as well as encourage participation. Only those men should be approached, however, who show promise of being able to deal with the problems, else lack of success might result in psychological casualties possibly followed by a real neurosis.

Guidance must differentiate between

1. the dynamic type of worker, who finds tasks on his own initiative, although his ultimate suggestions may not be perfect in form and his attitude may leave things to be desired;
2. the mechanistic research type who, when a task has been tactfully suggested to him and explained, will devote himself to its solution with a high degree of perseverance;
3. the static conservative type, who needs the task clearly stated because he reacts only to pressure, being on principle against any changes and thus often a hindrance.

The general principles of such guidance are summarized as follows:

1. As many employees as possible should be included.
2. The councilor should be assisted by a Party representative and a Labor Front man to remove all human-nature obstacles.
3. Frictions should be avoided as far as possible.
4. Guidance must be done tactfully.
5. There must be accord in the management about the matter.
6. Increase in plant production is secondary to national benefit.
7. The goal must be optimum plant and individual performance, that is: joy in work!

The plan is described as a typical example of German industrial rationalization: the worker becomes a full participant. To this end a "psychological climate" is required of mutual respect and confidence, in which, however, individual psychological inhibitions are removed in an understanding yet firm manner. That is why so much importance is attributed to industrial leadership and industrial psychology (27). Apparently it is the Party representative's function to insure the desired "firm manner."

#### IV. Vocational selection and training camps.

(1) *Selection camps for the gifted.* Early under the Nazi regime contests were instituted for all vocations as an incentive to apprentices, and other young people. These contests have recently been implemented by vocational selection camps to single out the most promising youths for special advanced training and study, with the view of supply-

ing commerce and industry with people who some day can fill responsible positions. The demand for such people is considered particularly urgent at present (7). Thus these selection camps must be seen as another measure to combat the increasing manpower shortage. They deal with young gifted specialists who have already distinguished themselves and have shown industry, reliability and character. Of these the best ones again are selected for further advancement, to avoid waste. Admitted to the camps are youths recommended by their employers, or proposed by chamber of commerce or the army, also former victors of vocational contests.

Selection camps have been functioning for many years in military selection (2), and the new vocational camps are modeled after the earlier military ones. Like the vocational contests, they are under the auspices of the German Labor Front, and in some instances also the Hitler Youth. They are located in pleasant country houses, and everything is done to avoid the atmosphere of a formal examination (16).

*Procedure:* The duration of a camp is usually one week. The participants live like soldiers, 8-10 in a group under a leader for the duration of the selection. The group leaders are experienced youth leaders, mostly from industrial training departments. The selection board consists of the camp leader, the group leaders, specialists, a psychologist and a physician. Appraised are (1) knowledge and ability, (2) leadership quality, (3) character and personality, and (4) health.

The *group leaders* evaluate the members of their groups from the human and character point of view on the basis of their daily contact with them. Two ideological talks are also worked out by the groups. The *psychologist* evaluates special talents and abilities, and general intelligence; determines technical comprehension and general education by written tests; asks the candidate for a written statement of his interests; and in conclusion, interviews each participant. The *camp leader* appraises each participant on the basis of personal contacts and conversations. He also sets the themes for the essays, on the basis of which intellectual flexibility is determined. First-class *specialists* are called in from the various industries to assess specialized technical proficiency, by written and oral tests. Evaluation is essentially influenced by the promise a youth holds to fill a leadership position in this field some day. The *medical examination* is concerned with general health, heredity and race.

In a *final conference* the selection board brings the various findings together to arrive at a decision. The decision is explained to the participant in detail. He is told where his strength lies and where he must still improve; and effort is also made to convince him of the validity of the decision. The results are communicated to his district and industry, so that these can take special care in case he deserves encouragement and support, and to use the results in placement (7).

So far, selection camps have been conducted for the metal industry, the chemical industry, and other war industries where they are said to have shown remarkable results. A few details are given regarding the camp of the metal industry where future inventors, airplane engineers, electrical engineers and low-voltage technicians are selected. Among their trade tests are: construction of bridges, calculation of gearing ratios, problems of metal production. The requirements for passing are ability of constructive technical thinking, knowledge of mathematics, imagination, will power, leadership ability, health. Genius is rare, even in these camps, but has occasionally been found. All participants in this particular camp were considered worthy of advancement and 70% capable of advancement (16).

The selection-camp method has been introduced also for candidates for elementary school teaching (26), and for musicians and actors (19, 8). The reason for the latter is that the continuation of art is considered to be of vital importance. But to avoid waste of manpower, only the most gifted must receive training. Of 64 participants in an art camp, only 29 were selected, while the rest were asked to return to their jobs.

(2) *Training camps.* Training camps may also be mentioned as an aspect of present-day German industrial psychology. The course for Refa-men described earlier is in the form of a camp session. Other such training courses have recently been introduced for personnel managers. These are conducted by Steinwarz's bureau at its schools in Vienna and Diedenshofen (9). Up to the present the German personnel managers apparently have been oriented primarily toward the administrative and legal aspects of their office. The new courses are aimed to make them realize that their main function is, after all, dealing with human beings. If workers and employees are not treated with tact and consideration, poor morale will be the consequence. The personnel manager must be trained to be cordial and just, the worker having a fine sense as to whether he is met with a genuine attitude of friendliness or only a pose. Qualifications for the personnel manager are a sincere interest in people, tactfulness, and intelligence. One of his new tasks is the organization of personality information on each employee, including a personality profile.

The most complete description of a training camp is found in an article on the training of foremen (25). One large chemical industry in southwestern Germany has been conducting a leadership course for foremen for the last year. Thirty to forty foremen at a time take this course where the atmosphere again is one of good fellowship with outings and a farewell party. There the *industrial psychologist* gains the confidence of the foremen and discusses with them problems of leadership on the basis of practical experiences contributed by the students. Proper treatment of workers is considered as practically the only field

where reserves in manpower can still be mobilized. While formerly foremen were selected purely from the technical point of view, old foremen now receive this training in leadership, and new promotions should be made only after psychological examination of leadership ability. Every evening of the camp session a talk is given by one of the plant executives: the president, the personnel manager, the manpower engineer, the plant physician, each discussing problems of his field which concern the foremen.

After the camp session, the group continues to meet with the psychologist at 4-6 week intervals for discussion of any leadership problem which may have arisen. The outcome is an insight into industrial relations and the significance of the function of the foreman, and a "more or less noticeable loosening up" of the participants. A camp of this nature is only one aspect in a large foreman training program which has been under way for some time under the auspices of the German Labor Front. Modern depth-psychology is given credit for the attempt to train leadership at all.

#### *V. Summary.*

Early in the 5th year of war manpower engineers have been appointed in the larger industrial plants in Germany with the authority to enforce any measure needed to mobilize the last manpower reserves. In connection with this drive, the work of industrial psychologists and motion and time study men has received wide attention. The following was found in the present brief survey:

1. Industrial employee testing is carried on along lines developed by German military psychology, and with similar aims.

2. Comparative psychological job analysis is undertaken, and a survey showed undersupply of abstract intelligence among the population as a whole.

3. Industrial merit rating is promoted as a method of proper individual placement.

4. Motion and time study (Refa method) finds increased application, and 50,000 Refa men have already been trained. The curriculum includes psychology.

5. A guided industrial suggestion system is being inaugurated to enlist every worker's inventive ability. The application of this system apparently also involves psychological training.

6. Selection camps for gifted young industrial workers are conducted, as well as selection camps for teachers, actors and musicians.

7. Training camps are conducted for Refa men, personnel managers and especially foremen. In the latter the psychologist seems to play the main part.

Throughout these various efforts the trend becomes apparent to

raise industrial morale by friendly treatment of the workers and by offering opportunities for advancement. In this respect the present effort is reminiscent of a German drive conducted in 1917 under the slogan of "Gangway for the able!"

## BIBLIOGRAPHY

1. ANSBACHER, H. L. Curtailment of military psychology in Germany. *Science*, 1943, 98, 218-219.
2. ANSBACHER, H. L. German military psychology. *Psychol. Bull.*, 1941, 38, 370-392.
3. B., E. Wissenschaft normt Lohn; Grundsätze des Refa-Verfahrens. *Das Reich*, Mar. 5, 1944.
4. BORNEMANN, E. Aufgaben der Arbeitspsychologie der Gegenwart. Teil I: Die Entwicklung des Eignungsuntersuchungswesens und ihre gegenwertigen Fragestellungen. *Stahl und Eisen*, 1944, 64, 37-47.
5. BORNEMANN, E. & GROENING, R. in *Industr. Psychotech.*, 1942, 19, 233 ff.
6. FRIEDRICH, A. Grundlinien des deutschen Rationalisierens. *Voelk. Beobacht.*, Mar. 21, 1944.
7. GROSSHOFF, H. E. Wie arbeiten die Ausleselager? *Voelk. Beobacht.*, Jan. 6, 1944.
8. HAVER, U. Das Haus der Temperamente. *Voelk. Beobacht.*, Feb. 7, 1944.
9. MERKES, H. Die Aufgaben des Personalleiters; der Personalleiter in Stabe des Betriebsführers. *Voelk. Beobacht.*, Feb. 22, 1944.
10. MICHILIG, P. Über die Lenkung persönlicher Energien durch das betriebliche Vorschlagswesen. *Voelk. Beobacht.*, Mar. 7, 1944.
11. P.W. Refa im Büro; Ausbildung von Arbeitsstudien kaufleuten und-beamten. *Hambg. Fremdenbl.*, Mar. 25, 1944.
12. SCHORN, M. in *Industr. Psychotech.*, 1942, 19, 207 ff.
13. SCHULZ, W. in *Stahl und Eisen*, 1937, 57, 1133-1142.
14. SIMONEIT, M. *Charakterdiagnostik*. Leipzig. 1943.
15. STEINWARZ, H. (Appraisal of lower leaders and candidates for lower leadership positions in industry.) *Voelk. Beobacht.*, Apr. 7, 1944.
16. TIMMERMANN, H. Künftige Erfinder unter der Lupe; Begabtenauslese in Reichsausleselager. *Hambg. Fremdenbl.*, Mar. 8, 1944.
17. *Der Arbeitseinsatzingenieur*. [Anon.] *Voelk. Beobacht.*, Oct. 19, 1943.
18. *Die drei Stufen der Eignungsuntersuchung*. [Anon.] *Voelk. Beobacht.*, Feb. 5, 1944.
19. *Lager für musikalischen Nachwuchs*. [Anon.] *Voelk. Beobacht.*, Feb. 21, 1944.
20. *Ist der Facharbeiter entbehrlich geworden?* [Anon.] *Hambg. Fremdenbl.*
21. *Leistungssteigerung im Büro; Refa schafft auch hier brauchbare Unterlagen*. [Anon.] *Voelk. Beobacht.*, Feb. 8, 1944.
22. (*Meeting of manpower engineers*.) [Anon.] *Voelk. Beobacht.*, Apr. 3, 1944.
23. *Refa-Erfolge in der Textilindustrie*. [Anon.] *Hambg. Fremdenbl.*, Mar. 16, 1944.
24. *Refa im Holzverarbeitenden Betrieb*. [Anon.] *Hambg. Fremdenbl.*, March. 21, 1944.
25. "Verachtet mir die Meister nicht . . ."; die Auswahl der Unterführer im Betrieb. [Anon.] *Deutsche Allg. Zeitung*, Mar. 23, 1944.
26. *Wer kann Volksschullehrer werden?* [Anon.] *Voelk. Beobacht.*, Feb. 25, 1944.
27. *Zwei Erdteile rationalisieren*. [Anon.] *Hambg. Fremdenbl.*, Apr. 1, 1944.

## BIBLIOGRAPHIES IN CHILD DEVELOPMENT: 1931-1943

FLORENCE L. GOODENOUGH\*

*Institute of Child Welfare, University of Minnesota*

In 1931 Allen† published a list of the most important reference bibliographies in child behavior and development which had appeared up to the year 1930. Because the amount of research work in this field which has been published since that date is so great, it has seemed worth while to bring the bibliography up to date (July, 1943) not only for the convenience of research workers and teachers of child psychology but also as a rough indication of the developing trends of interest within the field. While it is recognized that neither the number nor the length of the bibliographies on a given topic affords more than a rough approximation to the amount of psychological activity devoted to it, it is nevertheless true that some correlation exists. The serious student of any problem commonly begins his research by examining the literature, and most writers of experimental articles append at least a brief list of references to their published reports. Many of these lists, however, are short and highly specialized. Upon the assumption that the titles in these short lists will, for the most part, be included in the more comprehensive bibliographies in the same field and because of the need of confining our own list within reasonable limits, we have not, as a rule, included bibliographies having fewer than 50 titles. Some exceptions have been made when a shorter list is made up largely from unusual sources or deals with a topic on which the amount of published research is small.

In making the selection, the following considerations were held to be of main importance: (1) recency, upon the assumption that later lists will, as a rule, include at least the more important titles found in the earlier ones, (2) length, (3) selectivity with reference to the topic under consideration (some very long bibliographies are merely omnibuses that apparently include practically everything the author has ever read!), (4) emphasis upon articles dealing with children, and (5) completeness. In order to avoid overlap with Allen's list, no bibliographies appearing earlier than 1931 have been included. For the most part, only American and a few British sources have been consulted, although a fairly large proportion of foreign-language titles appear in many of the lists.

A number of areas closely connected with the field of child develop-

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† Allen, C. N. Bibliographies in child study and developmental psychology. *Psychol. Bull.*, 1931, 28, 277-296.

ment but not truly falling within its range have not been covered. Among the more important of these are the following: behavior problems and juvenile delinquency, mental hygiene, educational psychology nursery school education, methodological studies, including mental testing (except for a few of the very comprehensive bibliographies of mental tests that include a goodly number of titles dealing with the growth of intelligence), children's diseases and child nutrition, child training, parental education, educational and vocational guidance, child labor and social welfare. Allen's list includes some compilations within most of these fields; a fact that makes the two sets of reference material not entirely comparable with each other, but the volume of literature which has appeared during the past twelve years is so great that the inclusion of these topics would have brought our list to prohibitive length.

For convenience in reference we have divided the material into a number of broad groups. This plan was also followed by Allen but changing trends of interest have made it appear wise to revise his classification to some extent. As far as possible, the original publications have been examined in all cases; we have not followed Allen's practice of accepting the data given in the *Psychological Abstracts* at its face value except in a very small number of instances where the original sources were unavailable. As a result of this inspection, many lists, some of rather imposing length, were rejected because they failed to meet one or another of the criteria that had been decided upon. While it is practically certain that some important bibliographies have inadvertently been overlooked, an attempt has been made to list the most significant and complete compilations of each of the indicated topics that have appeared during the past twelve years.

*General sources:* The three major abstract journals, *Biological Abstracts*, *Child Development Abstracts*, and *Psychological Abstracts* unquestionably provide the most convenient means of keeping in touch with the current literature. Moreover, through their annual *Subject Indexes* they render it possible to locate the studies that have appeared on a given topic during any year. In addition to these, certain journals and monograph series appearing at more or less regular intervals devote special sections to summaries of the literature on child development. The *Elementary School Journal* publishes an annotated bibliography of investigations on the development of infants and preschool children each year in its March issue; a similar bibliography on exceptional children appears in each May number. The *Review of Educational Research* presents annotated bibliographies on various special aspects of child development at frequent intervals. Very complete reviews of special topics in this field also appear from time to time in the *Psychological Bulletin*.

Certain monograph series appearing at irregular intervals make a practice of appending excellent bibliographies to the experimental studies reported. Among these may be mentioned particularly the *Genetic Psychology Monographs*, the *Monographs of the Society for Research in Child Development*, and the *Monographs of the Child Welfare Station of the State University of Iowa*, the *Institute of Child Welfare of the University of Minnesota*, and the *Institute of Child Development of Teachers' College, Columbia University*.

**Handbooks.** At the time of Allen's study, nothing that could properly be regarded as a general reference book on child development had appeared. Since 1930, two editions of the *Handbook of Child Psychology* edited by Carl Murchison have been published, and a third edition, under the editorship of Leonard Carmichael, is now in press. Each of these notable volumes (2, 3) contains from 20 to 30 chapters on various aspects of child development and behavior, with very complete bibliographies appended to each. The *Encyclopedia of Educational Research* (1) edited by Walter Monroe has a special section on child development. Each of the 17 short articles in this section is followed by a brief but well selected list of references. The *Thirty-eighth Yearbook of the National Society for the Study of Education*, (4) "Child Development and the Curriculum" is likewise made up of special papers on different topics and the appended bibliographies, although selected with particular reference to their significance for child education, are more nearly comprehensive than those in the *Encyclopedia of Educational Research*.

**General Texts.** Under this heading Allen lists 48 titles with dates ranging from 1895 to 1930. This number is, however, very deceptive since there are numerous repetitions (the *Twenty-eighth Yearbook of the National Society for the Study of Education* receives 7 listings in this group alone, as well as a number of additional citations under special topics). Other titles deal with such special topics as psychoanalysis, nursery school procedures, behavior problems and the like. Only 18 of the 48 titles could properly be classed as general texts in child psychology. In contrast, the last twelve years have yielded at least an equal number of texts with very complete bibliographies as well as many more that have not been included in our list because their reference bibliographies were not sufficiently complete. The rapid growth of interest in the field is clearly mirrored in the marked increase in the output of textbooks. Some of the more popular of these have already gone through several editions.

**Physical growth and development.** Instruments of precision for the measurement of physical development antedate by many years those for the measurement of other types of growth. The early period of experimentation and the collation of the more obvious types of data in this field is past. Publication of the very complete bibliography of

studies on the physical growth of children which was prepared by the Children's Bureau in 1927 (No. 188 in Allen's list) and the elaborate catalogue compiled at the University of Minnesota under the direction of Scammon\* made further reviews in this field unnecessary for the time being. In Allen's study, references on physical growth are included in a miscellaneous grouping along with those dealing with motor control and sleep. Only 3 of his citations have to do primarily with physical growth.

Modern studies of physical growth show a number of rather notable trends that differentiate them from those of an earlier period. There is greater emphasis upon longitudinal studies of large groups of children measured at regular intervals over a period of years. The advantage of this type of approach has been pointed out especially by Shuttleworth (169) who has shown the great decrease in the experimental error of prediction resulting from the elimination of sampling errors that arise when age standards are based upon cross-sections of the population, which has been the general practice up to comparatively recent years. With the shift to a longitudinal approach, individual differences in growth trends as well as in momentary status have been more carefully observed and studied. The importance of noting variances as well as central tendencies of group measurements and of including these figures as essential features of standard tables is recognized. Bibliographies on some of the less usual measurements, such as Boyd's very careful compilation of the widely scattered literature on growth of the surface area of the body (25) also indicate the relatively advanced state of scientific activity in this field. Mention should also be made of the extensive work that has been done on the physical changes appearing at puberty (165, 169). For the most part, these have been included in the section on adolescence.

*Motor development, including sleep.* As in the case of physical growth, modern studies of motor development show a definite trend toward a longitudinal approach. Greatest interest has centered about the periods of infancy (47, 51, 142, 143, 146) and adolescence (43).

The earlier bibliographies cited by Allen on the subject of sleep tended to be very inclusive, with only a relatively small number of titles dealing with the sleep of children. Of the more recent compilations, that by Kleitman (48) is also unclassified, although it includes among its 1400 titles a goodly number on children. Thompson's list (53) is confined to the sleep of infants. The most generally useful is that by Renshaw, Miller and Marquis (50) which is well classified and indicates the various types of modern approach to the study of sleep.

\* Available in the form of a card file for use at the University by any interested person. Never published because it was felt that its great length would have made the cost disproportionately high.

A large number of brief reference lists on different aspects of the development of functional laterality have appeared during the past decade, and there have also been a good many reviews of its hypothetical relation to speech and its disorders, but we have been unable to locate any really inclusive and recent compilation of the literature on this much discussed topic. Selzer (52) stresses the problems of diagnosis and discusses remedial measures for problems assumed to arise from a change in dominance, while Downey's 1933 review (41) brings together a good many of the the more popular as well as the scientific reports.

*Sensation and perception.* Allen includes no bibliographies in this field, which, until recently, was but little explored by child psychologists. Scattered studies have appeared, it is true, for more than half a century but there have been few systematic attempts to bring the material into organized form. Even now, the amount of experimental work on the *development* of these functions is not great, though the sensory abilities of the neonate have been catalogued in some detail and there have been a few investigations on nursery school children. The development of color preference, which may be related to color vision, (58) and the ability to react selectively to differences in form have received some attention. Cruikshank (56) has assembled data on the interesting phenomenon of size-constancy from which little evidence of a "learning" process can be noted. This, of course, may mean only that learning is completed before the earliest age at which it has proved feasible to measure it.

*Language development.* In his review of this field, Allen predicted that the improved methods of control utilized by McCarthy\* would set a standard for many subsequent investigations. That this prophecy has been fulfilled is evidenced in the shift of emphasis from the casual records of the vocabularies of single children or of groups with undescribed linguistic and social background that were characteristic of an earlier period to the modern insistence upon the use of scientific criteria for defining both the sampling of subjects and the conditions under which the data were obtained. Better attention to experimental design is also shown in comparative studies of the language of special groups, such as the studies of twins, singly-born children and only children by Davis (63) and of bilingual children by Arsenian (62) and Smith (69). General surveys of recent developments in the entire area of linguistic development have been made by Anderson (61) and Sanford (68).

*Intellectual development.* A number of outstanding trends in the

\* McCarthy, Dorothea A. *Language development of the preschool child*. Minneapolis, Minn., University of Minnesota Institute of Child Welfare Monogr. No. 4, 1930. Pp. xii+174.

study of intellectual growth have been apparent during the past decade. First, there have been persistent attempts to develop measures by which the intellectual development of infants and young children may be appraised and their future mental progress predicted. The result has been the production of a rather large number of infant and preschool scales that show reasonably high self-correlation when the testings are separated by short time-intervals, but thus far no tests have been devised that show a significant correlation with the measured intellectual status of the same children in later childhood and adolescence. When the first tests are given before the age of 15-18 months, the correlations with later standing are zero or slightly negative (72, 76). Tests given during the nursery school period yield only a low or moderate correlation with those given during the school period or at maturity, with the reported  $r$ 's ranging from about  $+.30$  to  $+.70$ , according to the age of the children and the conditions of testing. By the age of six or seven years, however, the developmental process has become fairly stabilized. Intelligence quotients obtained at these ages show almost as high a correlation with final status as they ever will. If the generally accepted hypothesis that the mental growth curve is parabolic in form is the correct one, this, of course, is quite to be expected.

The question of the possible effects of environmental stimulation and special training procedures upon mental growth has provoked much experimental work and aroused almost an equal amount of controversial discussion. Both volumes of the *Thirty-ninth Yearbook of the National Society for the Study of Education* (80) are devoted to this topic. The interested reader is referred to this source both for original material and for many very complete and well selected bibliographies on the various phases of the question. Woodworth's (89) admirable critique of this Yearbook and of the literature upon which it is based should also be consulted.

A third important trend in the recent literature on intellectual growth is seen in the increasing use of longitudinal studies of the same children who are tested repeatedly over a period of time. This trend was also noted in the previous discussion of the work in physical growth. The advantages of this method in controlling the sampling are obvious. Furthermore, when, as is frequently the case, not only mental tests but physical measurements, educational tests and school progress, and personality measurements and observations are also included in the schedule, it becomes possible to investigate the changing trends of relationship among these variables as well as the growth of the separate functions.

We have made no attempt to include all of the many bibliographies on mental tests and testing that have appeared since 1931. Allen has listed the earlier compilations, but since his time the number has become

so great that the amount of space required would be prohibitive. The very comprehensive lists by Hildreth (78) and South (86) and the two editions of Buros' Mental Measurements Yearbook (74, 75) cite the most important of the books and articles in this field.

*Learning (including conditioning) and attention.* Although learning is far from being a new field of psychological investigation and children have been used as subjects in studies of learning for half a century or more, there are nevertheless significant differences between the older studies and those of more recent date. For the most part the older work with children was oriented toward the practical problems of formal education. Only recently has the study of learning in children become sufficiently divorced from pedagogy, sufficiently isolated from the studies of mental and motor development to warrant a special classification in the field of child development. Gradually we are coming to realize that learning, like other mental functions, has its developmental aspect.

Before the outbreak of the present war, a very important series of investigations in the field of conditioning was being conducted in Russia with children as subjects (96). In this country, the conditioning of infants and particularly of neonates has received considerable attention during the past decade or more.

The old concept of "attention" has been broken down into its behavioral aspects and considered in relation to different situations (98, 100). The relation of ease of learning to such factors as age, intelligence, race, physical condition, and of varying modes of presentation of the material to be learned continue to be popular subjects of investigation.

*Emotional, social and personality development.* Under this heading, Allen cites 26 bibliographies, many of which, however, are made up chiefly of references to the popular literature on child training. This is understandable enough when we recall that until comparatively recent years, attempts at scientific study of the growth of non-intellectual characteristics were few. However, the last ten or fifteen years have been notable for the many attempts at a scientific approach to those areas of child personality and conduct hitherto regarded as inaccessible to controlled experiment. The studies of Lewin and his co-workers have been rich in suggestions for research in field theory, personality structure, and on the effect of various types of frustration. At the time of Allen's report, the methods of time-sampling and of the situational analysis were still comparatively new; since that time they have been subjected to more careful scientific scrutiny and some of the early sources of error in their use have been corrected. Projective methods, including the Rorschach technique had not then been sufficiently popularized in this country to produce a single bibliography. Formalized personality inventories were limited almost wholly to revisions of the

Woodworth Personal Data Sheet devised for use with soldiers during World War I, and about the only standardized rating scale for the appraisal of a personality trait was that devised by Marston for the measurement of introversion-extroversion in young children.

In contrast, the last few years have witnessed the development of a host of devices intended to give insight into the inner life of the individual. The loose descriptive terms and the casual observation and inference that were formerly relied upon in attempting to account for the development of particular types of personality are rapidly giving way to more precise concepts that can be verified by direct experiment. The use of such terms as the "level of aspiration" has not only broadened our understanding of the nature of personality but has made it more dynamic and realistic.

The volume of recent work in this field is so great that anything approaching a complete list of the bibliographies that have appeared, especially those on highly specialized topics, would be of impracticable length. We have therefore aimed at selecting a relatively small number that are fairly recent and inclusive. While this has meant the omission of many excellent summaries it is hoped that the more important references, at least, have been included in the lists here cited.

No general section dealing with attitudes and interests of children was provided in Allen's summary of 1931, but he has a special section on play. Although the number of good bibliographies on the genetic aspects of this topic are few, the literature shows promise of a growing interest. Murphy, Murphy, and Newcomb (129), Jones and Burks (116), Hildreth (78), and Buros (74, 75) provide the best source material on this subject.

Research workers are especially interested in studying children's attitudes toward their parents and toward school as well as their general social attitudes. The widespread concern over vocational guidance has led to the preparation of a number of vocational interest inventories during the last decade. New techniques of measuring and scoring attitudes and interests have also been developed. The searching review of the literature on infancy and early childhood by Sears (134) with view to testing the psychoanalytic theories of infantile sexuality deserves special mention.

*Infancy, including the prenatal and neonatal periods.* For at least two decades, the periods of infancy and adolescence, because of the rapid development and specialized changes that take place at those times, have stimulated much scientific interest among anatomists and psychologists alike. A number of excellent bibliographies on the prenatal and neonatal growth and behavior of infants have recently been compiled, including a translation of Preyer's early monograph which includes an

excellent bibliography made up chiefly of German titles (153). Psychological interest is for the most part focussed upon the study of prenatal and neonatal reflexes, the development of the nervous system and the responses of the sense-organs. Another area of interest is that of premature birth and its effect on subsequent physical and mental development. General reviews of the literature on the neonatal and early post-natal periods have been published by Cattell (142), Dewey (143), the Shermans (156) and by Valentine and Dockeray (159). The literature in this area thus reflects a change from *general* observational treatment of prenatal and neonatal behavior to a concern for specific phenomena which, when understood, may have significant implications for later development.

*Adolescence.* Mill's very thoroughgoing survey of the literature on the age of the menarche (168) has exploded the old theory, still stated as a fact in many medical texts, that girls in warmer climates mature earlier than do those in the north. The excellent series of reports based on the Harvard Growth study will serve as models in this field for years to come. Reports from the extensive study of adolescence carried on at the Institute of Child Welfare of the University of California are just beginning to appear; it is to be expected that this investigation will provide much valuable information in the near future.

*Exceptional Children.* We have included a brief list of bibliographies on atypical children in spite of the fact that the topic falls somewhat outside the limits originally set, because of the fact that examination of the literature shows that a rather large proportion of the books and articles cited have adopted a genetic approach. The blind, the crippled, or the deaf child is no longer considered as a static type but as a growing individual.

The annotated bibliographies on this topic that appear annually in the May number of the *Elementary School Journal* cover the current literature fairly thoroughly. Of the bibliographies on special topics, probably the most comprehensive is that by McIntyre (180) on cerebral birth palsy.

*Children in wartime.* The systematic and large-scale evacuation of children from target areas is a practice as new in the history of mankind as is a war fought largely in the air. It is but natural, therefore, that doctors, psychologists, sociologists and others concerned with the welfare of children should attempt to study the effects of evacuation and of the war itself upon children. Although most of the studies thus far have not gone beyond the level of casual observation and anecdote, a small amount of material based on clinical observations and tests, medical data, and more or less quantitative psychological and physiological research has appeared. At the time this article was written, Despert's

monograph (183) represented the nearest approach to a systematic covering of this material but the appearance shortly thereafter of a more complete review and bibliography by Jersild and Meigs (185) requires special mention.

## BIBLIOGRAPHY

### I. HANDBOOKS

1. MONROE, W. S. (Ed.) *Encyclopedia of educational research: Section on child development*. New York: Macmillan, 1941. (Short bibliographies at end of each chapter).
2. MURCHISON, C. (Ed.) *A handbook of child psychology* (First edition). Worcester, Mass.: Clark Univ. Press, 1931. (Very complete bibliographies at end of each chapter).
3. MURCHISON, C. (Ed.) *A handbook of child psychology* (Second edition, revised). Worcester, Mass.: Clark Univ. Press, 1933. (Each of the two editions includes some chapters not found in the other).
4. NAT. SOC. STUD. EDUC. *Thirty-eighth Yearbook, Part I. Child development and the curriculum*. Bloomington, Ill.: Publ. School Pub. Co., 1939. (Bibliographies at end of chapters).

### II. TEXTBOOKS

5. BARKER, R. G., KOUNIN, J. S., & WRIGHT, H. P. (Eds.) *Child behavior and development*. New York: McGraw-Hill, 1943. (References at end of chapters numbering 4-48).
6. BLACKFAN, K. D. (Ed.) *Growth and development of the child*. New York: Century, 1932. (References at end of chapters—numbering 2-48).
7. BROOKS, F. D. & SHAFFER, L. A. *Child psychology*. Boston: Houghton Mifflin, 1937. (449 references).
8. BÜHLER, CHARLOTTE. *From birth to maturity*. London: K. Paul, French, Trubner and Co., 1935. (271 footnote references).
9. DEWEY, EVELYN. *Behavior development in infants*. New York: Columbia Univ. Press, 1935. (216 references).
10. FAEGRE, MARION & ANDERSON, J. E. *Child care and training* (6th Ed.). Minneapolis: Univ. Minn. Press, 1943. (References at end of book—8 pages).
11. GOODENOUGH, FLORENCE L. & ANDERSON, J. E. *Experimental child study*. New York: Century, 1931. (403 references).
12. HURLOCK, ELIZABETH. *Child development*. New York: Macmillan, 1942. (928 references).
13. JERSILD, A. T. *Child psychology*. New York: Prentice-Hall, 1940. (References at end of chapters numbering 11 to 95).
14. JOHNSON, BUFORD J. *Child psychology*. Springfield, Ill.: Charles C Thomas, 1932. (206 references).
15. KELLY, W. A. & KELLY, MARGARET R. *Introductory child psychology*. Milwaukee: Bruce, 1938. (References at end of chapters numbering 38 to 47).
16. MERRY, FRIEDA & MERRY, R. V. *From infancy to adolescence*. New York: Harpers, 1940. (178 references).
17. MUNN, N. L. *Psychological development: An introduction to genetic psychology*. Boston: Houghton Mifflin, 1938. (824 references).
18. NAGGE, J. W. *Psychology of the child*. New York: Ronald Press, 1942. (References at end of chapters).

19. SHERBON, FLORENCE B. *The child, his origin, development and care*. New York: McGraw-Hill, 1934. (References at end of chapters numbering from 5 to 50).
20. SKINNER, C. E., et al. *Child psychology*. New York: Macmillan, 1941. (References at end of chapters).
21. STODDARD, G. & WELLMAN, BETH. *Child psychology*. New York: Macmillan, 1934. (493 references).
22. TEAGARTEN, FLORENCE. *Child psychology for professional workers*. New York: Prentice-Hall, 1940. (1171 references).
23. WATSON MAUDE. *Children and their parents*. New York: Crofts, 1932. (79 references).
24. WERNER, H. *Comparative psychology of mental development*. New York: Harpers, 1940. (751 references, chiefly German).

### III. PHYSICAL GROWTH AND DEVELOPMENT

25. BOYD, EDITH. *The growth of the surface area of the human body*. Univ. Minn. Inst. Child. Welf., Monogr. No. 10, Minneapolis: Univ. Minn. Press, 1935. (197 references).
26. CAMERON, A. T. *Recent advances in endocrinology*. Philadelphia: Blakiston, 1936. (1470 references).
27. CONEL, J. L. *The post-natal development of the human cerebral cortex*. Cambridge: Harvard Univ. Press, 1941. Vol. I—*The cortex of the newborn*. (37 references). Vol. II—*The cortex of the one-month infant*. (36 references).
28. DEARBORN, W. F., ROTHNEY, S. W. M., & SHUTTLEWORTH, F. K. Data on the growth of public school children. *Monogr. Soc. Res. Child Developm.*, 1938, 3, No. 1. (75 references, annotated).
29. FLOREY, C. D. Osseous development in the hand as an index of skeletal development. *Monogr. Soc. Res. Child Developm.*, 1936, 1, No. 3. (139 titles).
30. KNOTT, VIRGINIA B. *Physical measurements of young children*. Univ. Iowa Stud. Child Welf., 1941, 18, No. 3. (44 references).
31. JONES, H. E., BAYLEY, NANCY, BROOKS, F. D., CATTELL, PSYCHE & STODDARD, G. D. Mental and physical development. *Rev. Educ. Res.*, 1938, 9, 3-139. (637 titles).
32. KELLEY, H. J. & REDFIELD, J. E. Physical growth from birth to maturity. *Rev. Educ. Res.*, 1941, 11, 573-591. (163 references).
33. KROGMAN, W. M. Growth of man. *Tabulae biological*, 1941, 20, den Haag, Netherlands: Junk. (400 references from all countries).
34. MEREDITH, H. V. Physical growth of white children (A review of American research prior to 1900). *Monogr. Soc. Res. Child Developm.*, 1936, 1, No. 1. (83 titles).
35. SANDERS, B. S. *Environment and growth*. Baltimore: Warwick and York, 1934. (Bibliography of 65 pages).
36. SMITH, J. R. The electroencephalogram during normal infancy and childhood. I Rhythmic activities present at birth and their subsequent development. II, The nature of the growth of the alpha waves. III, Preliminary observations on the pattern sequence during sleep. *J. Genet. Psychol.*, 1938, 53, 431-482. (57 titles. Three consecutive articles).
37. STODDARD, G. D., BROOKS, F. D., CATTELL, PSYCHE & JONES, H. E. Mental and physical development. *Rev. Educ. Res.*, 1933, 3, 84-181.
38. STODDARD, G. D., BROOKS, F. D., CATTELL, PSYCHE, JONES, H. E., & MEEK, LOIS H. Mental and physical development. *Rev. Educ. Res.*, 1936, 6, 2-152. (631 references).

## IV. MOTOR DEVELOPMENT, INCLUDING LATERALITY AND SLEEP

39. BAYLEY, NANCY. Development of motor abilities during the first three years. *Monogr. Soc. Res. Child Developm.*, 1935, 1, No. 1. (35 titles).
40. BAYLEY, NANCY & ESPENSCHADE, ANNA. Motor development from birth to maturity. *Rev. Educ. Res.*, 1941, 11, 562-572. (97 titles).
41. DOWNEY, JUNE E. Laterality of function. *Psychol. Bull.*, 1933, 30, 109-142. (219 references).
42. EIGLER, P. The effect of unusual stimulation on motor coordination in children. *Child Developm.*, 1932, 3, 207-229. (39 references).
43. ESPENSCHADE, ANNA. Motor performance in adolescence. *Monogr. Soc. Res. Child Developm.*, 1940, 5, No. 1. (80 titles).
44. GARVEY, C. R. The activity of young children during sleep. *Univ. Minn. Inst. Child Welf.*, Monogr. No. 18, Minneapolis: Univ. Minn. Press, 1939. (61 references).
45. GIESECKE, MINNIE. The genesis of hand preference. *Monogr. Soc. Res. Child Developm.*, 1935, 1, No. 5. (20 titles).
46. GUTTERIDGE, MARY V. A study of motor achievements of young children. *Arch. Psychol.*, N. Y., 1939. No. 244. (66 titles).
47. HALVERSON, H. M. Studies of the grasping of early infancy. III. *J. Genet. Psychol.*, 1937, 51, 425-449. (53 titles).
48. KLEITMAN, N. *Sleep and wakefulness*. Chicago: Univ. Chicago Press, 1939. (Over 1400 titles).
49. MCGRAW, MYRTLE B., & BREEZE, K. W. Quantitative studies in the development of erect locomotion. *Child Developm.*, 1941, 12, 267-303. (35 titles).
50. RENSHAW, S., MILLER, V. L. & MARQUIS, DOROTHY P. *Children's Sleep*. New York: Macmillan, 1933. (255 titles).
51. SCOE, H. F. Bladder control in infancy and early childhood. *Univ. Iowa Stud. Child Welf.*, 1933, 5, No. 4. (51 titles).
52. SELZER, C. A. Lateral dominance and visual fusion. *Harv. Monogr. Educ.*, 1933, No. 12. Cambridge: Harvard Univ. Press. (244 titles).
53. THOMPSON, HELEN. Sleep requirements during infancy. *Psychol. Monogr.*, 1936, 47, 64-123. (30 titles).

## V. SENSATION AND PERCEPTION

54. BING-CHUNG, LING. A genetic study of sustained visual fixation and associated behavior in the human infant from birth to six months. *J. Genet. Psychol.*, 1942, 61, 227-277. (30 titles).
55. CARMICHAEL, L. The experimental embryology of mind. *Psychol. Bull.*, 1941, 38, 1-28. (64 titles).
56. CRUIKSHANK, RUTH M. The development of visual size constancy in early infancy. *J. Genet. Psychol.*, 1941, 58, 327-351. (33 titles).
57. PECK, L. & HODGES, A. B. A study of racial differences in eidetic imagery of pre-school children. *J. Genet. Psychol.*, 1937, 51, 141-161. (37 titles).
58. STAPLES, RUTH. Color vision and color preference in infancy and childhood. *Psychol. Bull.*, 1931, 28, 297-308. (44 titles).
59. SMITH, JOSEPHINE M. The relative brightness values of three hues for new born infants. *Univ. Iowa Stud. Child Welf.*, 1936, 12, 91-140. (53 titles).
60. WALTERS, SISTER ANNETTE. A genetic study of geometrical-optical illusions. *Genet. Psychol. Monogr.*, 1942, 25, 101-155. (94 titles).

## VI. LANGUAGE DEVELOPMENT

61. ANDERSON, J. E. The development of spoken language. *38th Yearbook Nat. Soc. Stud. Educ.*, 1939, Part I, 211-224. (53 titles).
62. ARSENIAN, S. Bilingualism and mental development. *Teach. Coll. Contr. Educ.*, 1937, No. 712. (171 titles).
63. DAVIS, EDITH A. The development of linguistic skill in twins, singletons with siblings, and only children from age five to ten years. *Univ. Minn. Inst. Child Welf. Monogr.* No. 14. Minneapolis: Univ. Minn. Press, 1939. (163 titles).
64. FAHEY, J. L. The questioning activity of children. *J. Genet. Psychol.*, 1942, 60, 337-357. (55 titles).
65. HUYCK, E. MARY. The hereditary factors in speech. *J. Speech Disorders*, 1940, 5, 295-304. (39 titles).
66. IRWIN, O. C. Research on speech sounds for the first six months of life. *Psychol. Bull.*, 1941, 38, 277-285. (21 titles).
67. JANUS, S. Q. An investigation of the relationship between children's language and their play. *J. Genet. Psychol.*, 1943, 62, 3-61. (43 titles).
68. SANFORD, F. H. Speech and personality. *Psychol. Bull.*, 1942, 39, 811-845. (106 titles).
69. SMITH, MADORAH E. Some light on the problem of bilingualism as found from a study of the progress in mastery of English among preschool children of non-American ancestry in Hawaii. *Genet. Psychol. Monogr.*, 1939, 21, 119-284. (37 titles).
70. YOUNG, FLORENCE L. An analysis of certain variables in a developmental study of language. *Genet. Psychol. Monogr.*, 1941, 23, 3-141. (92 titles).

## VII. INTELLECTUAL DEVELOPMENT

71. ANASTASI, ANNE. The influence of specific experience upon mental organization. *Genet. Psychol. Monogr.*, 1936, 18, 245-355. (277 titles).
72. BAYLEY, NANCY. Mental growth during the first three years. *Genet. Psychol. Monogr.*, 1933, 14, 1-92. (63 titles).
73. BENTON, A. L. Mental development of prematurely born children. *Amer. J. Orthopsychiat.*, 1940, 10, 719-747. (71 titles).
74. BUROS, O. K. (Ed.) *The 1938 mental measurements yearbook*. New Brunswick, N. J.: Rutgers Univ. Press, 1938. (Covers new tests published from 1933-1937).
75. BUROS, O. K. (Ed.) *The 1940 mental measurements yearbook*. Highland Park, N. J.: Mental Measurements Yearbook, 1941. (Covers tests published from 1937-1940).
76. GOODENOUGH, FLORENCE L. & MAURER, KATHERINE M. *Mental growth of children from two to fourteen years*. Inst. Child Welfare Univ. Minn. Monogr. 19, Minneapolis: Univ. Minn. Press, 1942. (79 references).
77. HALLOWELL, DOROTHY K. Validity of mental tests for young children. *J. Genet. Psychol.*, 1941, 58, 265-288. (45 titles).
78. HILDRETH, GERTRUDE H. *A bibliography of mental tests*. New York: Psychol. Corp., 1939. (4279 references).
79. LAWRENCE, EVELYN M. An investigation into the relation between intelligence and inheritance. *Brit. J. Psychol. Monogr. Suppl.* 15, 1931, 5, 1-80. (179 titles).
80. NAT. SOC. STUD. EDUC. *Thirty-ninth Yearbook*. Intelligence: its nature and nurture. Part I: Comparative and critical exposition. Part II: Original studies and experiments. Bloomington, Ill.: Publ. School Pub. Co., 1940. (Bibliography after each chapter).

81. NEFF, W. S. Socio-economic status and intelligence: a critical survey. *Psychol. Bull.*, 1938, 35, 727-755. (63 titles).
82. NEMZEK, C. L. The constancy of the I.Q. *Psychol. Bull.*, 1933, 30, 143-168. (247 titles).
83. NEWELL, C. D. The uses of the form board in the mental measurement of children. *Psychol. Bull.*, 1931, 28, 309-318. (90 titles).
84. PINTNER, R. Intelligence tests. *Psychol. Bull.*, 1932, 29, 93-119 (179 titles); 1933, 30, 488-504 (237 titles); 1934, 31, 453-475 (175 titles); 1935, 32, 453-472 (163 titles).
85. SKODAK, MARIE. *Children in foster homes: a study of mental development*. Univ. Iowa Stud. Child Welf., 1939, 16, No. 1. (116 titles).
86. SOUTH, E. B. *An index of periodical literature in testing, 1921-1936*. New York: Psychol. Corp., 1937. (5005 titles).
87. THORNDIKE, R. L. "Constancy" of the I.Q. *Psychol. Bull.*, 1940, 37, 167-186. (112 titles).
88. WELLMAN, BETH L. *The intelligence of preschool children as measured by the Merrill-Palmer Scale of performance tests*. Univ. Iowa Stud. Child Welf., 1938, 15, No. 3. (41 titles).
89. WOODWORTH, R. S. *Heredity and environment: a critical survey of recently published material on twins and foster children*. New York: Soc. Sci. Res. Council, 1941. (72 references).  
(See also the very complete annotated bibliographies in *Rev. Educ. Res.* for years 1932, 1933, 1935, 1936, 1938, 1939 and 1941.)

#### VIII. LEARNING, INCLUDING CONDITIONING AND ATTENTION

90. BLANKENSHIP, A. B. Memory span: a review of the literature. *Psychol. Bull.*, 1938, 35, 1-25. (146 references).
91. GESELL, A. The conditioned reflex and the psychiatry of infancy. *Amer. J. Orthopsychiat.*, 1938, 8, 19-30. (57 references).
92. MCCAY, JEANETTE B., WARING, ETHEL B., & KRUSE, P. J. Learning by children at noon-meal in a nursery school: ten "good" eaters and ten "poor" eaters. *Genet. Psychol. Monogr.* 1940, 22, 491-555. (45 references).
93. MARQUIS, DOROTHY P. Learning in the neonate. *J. Exp. Psychol.*, 1941, 29, 263-282. (21 references, mainly on conditioning).
94. MATTSON, MARION L. The relation between the complexity of the habit to be acquired and the form of the learning curve in young children. *Genet. Psychol. Monogr.*, 1933, 13, 299-398. (105 references).
95. MELCHER, RUTH T. Children's motor learning with and without vision. *Child Developm.*, 1934, 5, 315-350. (39 references).
96. RAZRAN, G. H. S. Conditioned responses in children: a behavioral and quantitative critical review of experimental studies. *Arch. Psychol.*, N. Y., 1933, No. 148. (84 references).
97. SCHMIDT, H. O. The effects of praise and blame as incentives to learning. *Psychol. Monogr.*, 1941, 53, No. 3. (84 references).
98. SHACTER, HELEN S. Personality tendencies and sustained attention in preschool children. *J. Soc. Psychol.*, 1934, 5, 313-328. (39 references).
99. WAGONER, LOVISA C. *The development of learning in young children*. New York: McGraw-Hill, 1933. (392 footnote references).

100. WARING, ETHEL B. & JOHNSON, M. W. *Helping children learn*. Ithaca: Cornell Univ. Press, 1941. (162 annotated general references, 642 chapter references).
101. WENGER, M. A. An investigation of conditioned responses in human infants. *Univ. Iowa Stud. Child Welf.*, 1936, 12, No. 1, 7-90. (70 references).
102. WENGER, M. A. & WILLIAMS, H. M. Experimental studies of learning in infants and preschool children. *Psychol. Bull.*, 1935, 32, 276-305. (99 references).

IX. EMOTIONAL, SOCIAL AND PERSONALITY DEVELOPMENT  
INCLUDING THE GROWTH OF ATTITUDES AND INTERESTS

103. ANDERSON, J. E. The development of social behavior. *Amer. J. Sociol.*, 1939, 44, 839-857. (47 titles).
104. ARRINGTON, RUTH E. Time sampling in studies of social behavior: a critical review of techniques and results with research suggestion. *Psychol. Bull.*, 1943, 40, 81-124. (79 titles).
105. BOTT, HELEN McM. *Personality development in young children*. Toronto, Can.: Univ. Toronto Press, 1934. (62 titles).
106. CAMPBELL, A. A. The personality adjustments of only children. *Psychol. Bull.*, 1934, 31, 193-203. (75 titles).
107. CAMPBELL, ELISE H. The social-sex development of children. *Genet. Psychol. Monogr.*, 1939, 21, 461-552. (72 titles).
108. DOLL, E. A. Annotated bibliography on the Vineland Social Maturity Scale. *J. Consult. Psychol.*, 1940, 4, 123-132. (66 titles).
109. DOLLARD, J., ET AL. *Frustration and aggression*. New Haven, Conn.: Yale Univ. Press, 1939. (189 titles).
110. EBERHART, J. C. Attitudes toward property: a genetic study by the paired comparison method. *J. Genet. Psychol.*, 1942, 60, 3-35. (31 titles).
111. ELIOT, ABIGAIL A. Eating habits in relation to personality development of two and three-year-old children. *Genet. Psychol. Monogr.*, 1933, 13, 399-481.
112. GOODENOUGH, FLORENCE L. *Anger in young children*. Univ. Minn. Inst. Child Welfare Monogr. No. 9, Minneapolis: Univ. Minn. Press, 1931. (172 titles, annotated).
113. HURLOCK, ELIZABETH B. Experimental investigations of children's play. *Psychol. Bull.*, 1934, 31, 47-66. (128 titles).
114. JACKSON, V. D. The measurement of social proficiency. *J. Exper. Educ.*, 1940, 8, 422-474. (88 titles).
115. JERSILD, A. T. & HOLMES, FRANCES. *Children's fears*. Child Developm. Monogr. No. 20. New York: Bureau Publ. Teachers' Coll., Columbia Univ., 1935. (45 references).
116. JONES, MARY C. & BURKS, BARBARA S. Personality development in childhood: a survey of problems, methods and experimental findings. *Monogr. Soc. Res. Child Developm.*, 1936, 1, No. 4. (684 references).
117. JUSTIN, FLORENCE. A genetic study of laughter provoking stimuli. *Child Developm.*, 1932, 3, 114-136. (36 titles).
118. KOSHUK, RUTH P. Social influences affecting the behavior of young children. *Monogr. Soc. Res. Child Developm.*, 1941, 6, No. 2. (525 references).
119. KLOFFER, B. & KELLEY, D. M. *The Rorschach technique*. Yonkers, N. Y.: World Book, 1942. (570 references).
120. LUECKE, EDITHA. Factors related to children's participation in certain types of home activity. *Teach. Coll. Contr. Educ.*, No. 839, 1941. (60 titles).

121. MALLER, J. B. Studies in character and personality in German psychological literature. *Psychol. Bull.*, 1933, 30, 209-232. (236 titles).
122. MALLER, J. B. Character and personality tests. *Psychol. Bull.*, 1934, 31, 501-524. (269 titles).
123. MALLER, J. B. Character and personality tests. *Psychol. Bull.*, 1935, 32, 500-523. (228 titles).
124. MARY, SISTER & HUGHES, M. M. The moral and religious development of the pre-school child. *Stud. Psychol., Psychiat., Cathol. Univ. Amer.*, 1936, 4, No. 1. (55 titles).
125. McLAUGHLIN, SISTER MARY A. The genesis and constancy of ascendance and submission as personality traits. *Univ. Ia. Stud. Educ.*, 1931, 6, No. 5. (141 titles).
126. MEEK, LOIS H. *The personal-social development of boys and girls. With implications for secondary education.* New York: Committee on Workshops, Progr. Educ. Ass'n, 1940. (98 titles).
127. MELBO, I. R. A review of the literature on children's interests. *Yearb. Calif. Elem. Sch. Prin. Assn.*, 1940, 12, 6-22. (No bibliog. but 52 ref. in footnotes).
128. MELTZER, H. The development of children's nationality preferences, concepts, and attitudes. *J. Psychol.*, 1941, 11, 343-358. (32 titles).
129. MURPHY, G., MURPHY, LOIS B. & NEWCOMB, T. M. *Experimental social psychology.* New York: Harpers, 1937. (1111 references, many dealing with children).
130. MURPHY, LOIS B. Social and emotional development. *Rev. Educ. Res.*, 1941, 11, 479-501. (171 titles).
131. OLSON, W. C. Measures of character and personality through conduct and information.—Psychological tests. *Rev. Educ. Res.*, 1935, 5, 273-290, 325-331. (161 titles).
132. ROTHNEY, J. W. M. & ROENS, B. A. Applications of personality and character tests. *Rev. Educ. Res.*, 1941, 11, 94-108. (103 titles).
133. SCHETTTLER, C. Topical summaries of current literature: personality traits. *Amer. J. Sociol.*, 1931, 45, 234-258. (308 titles).
134. SEARS, R. R. Survey of objective studies of psychoanalytic concepts. New York: Soc. Sci. Res. Council. Bull., No. 51. (bibliography of 9 pages).
135. SIMPSON, MARGARETE. Parent preferences of young children. *Teach. Coll. Contr. Educ.*, 1935, No. 652. (42 titles).
136. SNYDER, W. U. A survey of recent studies in the measurement of personality, attitudes and interests of adolescents. *J. Gen. Psychol.*, 1941, 25, 403-420. (50 titles).
137. STOGDILL, R. M. Survey of experiments on children's attitudes toward parents: 1894-1936. *J. Genet. Psychol.*, 1937, 51, 293-303. (37 titles).
138. SWAN, CARLA. Individual differences in the facial-expressive behavior of preschool children: A study by the time-sampling method. *Genet. Psychol. Monogr.*, 1938, 20, 557-650. (150 titles).
139. SYMONDS, P. M. & SAMUEL, E. A. Projective methods in the study of personality. *Rev. Educ. Res.*, 1941, 11, 80-93. (81 titles).
140. WATSON, G. Personality and character measurement. *Rev. Educ. Res.*, 1938, 8, 269-291; 340-352. (328 titles).
141. YOUNG, K. *Personality and problems of adjustment.* New York: Crofts, 1940. (32 pages of references, a large proportion of which deal with children).

#### X. INFANCY, INCLUDING THE PRENATAL AND NEONATAL PERIODS

142. CATTELL, PSYCHE. The development of motor functions and mental abilities in infancy. *Rev. Educ. Res.*, 1939, 9, 5-17. (86 references).

143. DEWEY, EVELYN. Behavior development in infants—a survey of the literature on prenatal and postnatal activity: 1920-1934. New York: Columbia Univ. Press, 1935. (216 references).
144. EDGERTON, A. E. Ocular observations and studies of the newborn. *Arch. Ophthalm.*, 1934, 11, 838-867. (230 references).
145. HALLER, M. W. The reactions of infants to changes in the intensity and pitch of pure tone. *J. Genet. Psychol.*, 1932, 40, 162-180. (31 references).
146. HALVERSON, H. M. An experimental study of prehension in infants, by means of systematic cinema records. *Genet. Psychol. Monogr.*, 1931, 10, 107-236. (69 references).
147. HALVERSON, H. M. Infant sucking and tensional behavior. *J. Genet. Psychol.*, 1938, 53, 365-430. (72 references).
148. HURLOCK, ELIZABETH B. Experimental studies of the newborn. *Child Developm.*, 1933, 4, 149-163. (76 references).
149. LANGWORTHY, O. R. Development of behavior patterns and myelinization of the nervous system in the human fetus and infant. *Contr. Embryol.*, Carnegie Inst. of Washington, 1933, 24, No. 139. (136 references).
150. MEREDITH, H. V. & BROWN, A. W. Growth in body weight during the first ten days of postnatal life. *Human Biology*, 1939, 11, 24-77. (47 references).
151. PRATT, K. C. The organization of behavior in the newborn infant. *Psychol. Rev.*, 1937, 44, 470-491. (45 references).
152. PRATT, K. C., NELSON, A. K. & SUN, K. H. *The behavior of the newborn infant*. Columbus: Ohio State U. Press, 1930. (313 references).
153. PREYER, W. Embryonic motility and sensitivity. *Monogr. Soc. Res. Child Developm.*, 1937, 2, No. 6. (104 references).
154. RICHARDS, T. W. & IRWIN, O. C. *Plantar response of infants*. Univ. Ia. Stud. Child Welf., 1934, 11, No. 1. (117 references).
155. RICHARDS, T. W. & IRWIN, O. C. Experimental methods used in studies on infant reactions since 1900. *Psychol. Bull.*, 1934, 31, 23-46. (117 references).
156. SHERMAN, M., SHERMAN, IRENE & FLORY, C. D. Infant behavior. *Comp. Psychol. Monogr.*, 1936, 12, 1-107. (39 references).
157. SHIRLEY, MARY M. *The first two years: a study of twenty-five babies*. Vol. I. Postural and locomotor development; Vol. II. Intellectual development; Vol. III. Personality manifestations. Univ. of Minn. Inst. Child Welf. Monogr. Nos. 6, 7, 8. Minneapolis: Univ. Minn. Press, 1933. (144 references).
158. SONTAG, L. W. & RICHARDS, T. W. Studies in fetal behavior. I. Fetal heart rate as behavioral indicator. *Monogr. Soc. Res. Child Developm.*, 1938, 3, No. 4. (62 references).
159. VALENTINE, W. L. & DOCKERAY, F. C. The experimental study of the newborn—1926-36. *Educ. Res. Bull. Ohio. State Univ.*, 1936, 15, 127-133. (41 references).
160. WINDLE, W. F. *Physiology of the fetus—origin and extent of function in prenatal life*. Philadelphia: Saunders, 1940. (References at end of chapters).

## XI. ADOLESCENCE

161. AVERILL, L. A. *Adolescence*. New York: Houghton Mifflin, 1936. (References at end of chapters—totaling 239).
162. BROOKS, F. D. Mental development in adolescence. *Rev. Educ. Res.*, 1936, 6, 85-101. (42 references).
163. GARRISON, K. C. *The psychology of adolescence*. New York: Prentice-Hall, 1940. (References at end of chapters).

164. GREULICH, W. W., DAY, H. G., LACHMAN, S. E., WOLFE, J. B., & SHUTTLEWORTH, F. K. A handbook of methods for the study of adolescent children. *Monogr. Soc. Res. Child Developm.*, 1938, 3, No. 2. (Extensive bibliographies at end of each chapter).
165. GREULICH, W. W., DORFMAN, R. I., CATCHPOLE, H. R., SOLOMON, C. I. & CULOTTA C. S. Somatic and endocrine studies of puberal and adolescent boys. *Monogr. Soc. Res. Child Developm.*, 1942, 6, No. 3. (77 references).
166. KEENE, C. M. & STONE, C. P. Mental status as related to puberty praecox. *Psychol. Bull.*, 1937, 34, 123-133. (78 titles).
167. MENEFEE, LOUISE A. & CHAMBERS, M. M. American youth: an annotated bibliography. Washington: American Council on Education, 1938. (2500 references).
168. MILLS, C. A. Geographic and time variations in body growth and age at menarche. *Human Biol.*, 1937, 9, 43-56. (The 13 titles in the bibliography refer chiefly to other bibliographies; the review itself summarizes the original studies).
169. SHUTTLEWORTH, F. K. Sexual maturation and the skeletal growth of girls age six to nineteen. *Monogr. Soc. Res. Child Developm.*, 1937, 2, No. 5 (37 references).

## XII. EXCEPTIONAL CHILDREN

(See annual annotated bibliographies in May number of the *Elementary School Journal*, not listed here. This list includes only a small number of recent or very comprehensive compilations.)

170. ABEL, THEODORA M. & KINDER, ELAINE F. *The subnormal adolescent girl*. New York: Columbia Univ. Press, 1942. (17 pages of bibliography).
171. BEST, H. *Blindness and the blind in the United States*. New York: Macmillan, 1934. (Extensive bibliography in footnotes).
172. BRADLEY, C. *Schizophrenia in childhood*. New York: Macmillan, 1941. (118 references).
173. BRUNSCHWIG, LILY. A study of some personality aspects of deaf children. *Teach. Coll., Contr. Educ.*, No. 687, 1936. (86 references).
174. CARROLL, H. A. *Genius in the making*. New York: McGraw-Hill, 1940. (40 references).
175. GARRISON, K. C. *The psychology of exceptional children*. New York: Ronald, 1940. (76 references).
176. HECK, A. D. *The education of exceptional children*. New York: McGraw-Hill, 1940. (References at end of chapters).
177. LOUHTI, C. M. *Clinical Psychology: A handbook of children's behavior problems*. New York: Harpers, 1936. (43 pages of references).
178. MACKANE, KEITH. A comparison of the intelligence of deaf and hearing children. *Teach. Coll., Contr. Educ.*, No. 585, 1933. (50 references).
179. MARTENS, ELISE H. An annotated bibliography on the education and psychology of exceptional children. U. S. Office of Education, Pamphlet No. 23, 1931. (302 references).
180. MCINTYRE, J. T. (Compiler). *Cerebral birth palsy bibliography*. National Society for Crippled Children, Elyria, Ohio. *Institutional Bull.*, No. 30, 1941. (840 references).
181. SCHEIDEMANN, NORMA V. *Psychology of exceptional children*. Boston: Houghton Mifflin, 1931. (References at end of chapters).
182. WHITE HOUSE CONFERENCE ON CHILD HEALTH AND PROTECTION. *Special education: the handicapped and the gifted*. New York: Century, 1931. (References at end of chapters, numbering from 7 to 123).

## XIII. CHILDREN AND THE WAR

183. DESPERT, J. LOUISE. Preliminary report on children's reactions to the war, including a critical survey of the literature. New York: Cornell Univ., Med. Coll., 1942. (111 references).
184. ELIOT, MARTHA M. Civil defense measures for the protection of children: report of observations in Great Britain: February, 1941. Washington: U. S. Gov't Printing Office, 1942. (177 references).
185. JERSILD, A. T. & MEIGS, MARGARET F. Children and war. *Psychol. Bull.*, 1943, 40, 541-573. (141 references).

## THE MECHANISM OF MONOCULAR ACCOMMODATION IN MAN

RALPH H. GUNDLACH

*University of Washington*

Helmholtz's theory of monocular accommodation (11), which psychologists endorse often without expounding, is essentially as follows. The organ of accommodation is the lens, which modifies the accommodative power of the eye by changes in its shape. The change in shape occurs mostly in the anterior surface, and is caused by complex relations between the ciliary muscle, the suspensory ligament, and the elastic nature of the lens itself. Thus, when the circular fibers of the ciliary muscle are relaxed, the lens is stretched out by the tensions conveyed through the suspensory ligament, and the eye is accommodated for distant vision. When the ciliary muscle contracts, the diameter of its inner circle is decreased, thus releasing the tension of the suspensory ligaments, and permitting the elastic lens to increase its curvature as required for accommodation for near vision.

The major view in opposition to Helmholtz is that of Tscherning (22, 23) and his pupils. This theory denies that the lens is an elastic body. Accommodation, they hold, is due to changes in the lens curvature brought on by an active pressure initiated by the contracting ciliary muscle. When the ciliary body contracts it puts a tension on that part of the suspensory ligament that is attached to the forward surface of the lens, thus pulling the lens backward; but at the same time, the contraction pulls the choroid in and compresses the vitreous humor such that the vitreous presses against the back of the lens. The resultant of these pressures keeps the lens in place but forces it to bulge at its anterior pole. Thus the item at issue between Helmholtz and Tscherning is whether or not the lens is elastic (or the lens capsule); or stated another way, whether or not the contraction of the ciliary muscle *allows* the lens to increase its convexity, or *forces* it to assume the proper shape.

From an inspection of texts in physiological psychology and some in general psychology, one can gain the impression only that the question of the mechanism of accommodation was settled once for all by Helmholtz, and that nothing of significance has appeared since his formulation. One would never know from these texts that he had antagonists to his theory of accommodation just as he had opponents to his theory of hearing and to his theory of vision, and that these opponents had some ground for their opinion. Yet the work of this line of investigators has been persistent and has now built up a challenging body of factual evidence which calls the great master in question, just as he has been

challenged, and modified or reversed, in other fields. Let us examine some of these texts.

Ladd and Woodworth's *Elements of Physiological Psychology* (14), the standard for many years, describes the Helmholtz notion and does not mention Tscherning. Troland's accounts, both in Murchison's *Foundations of Experimental Psychology* (20), and in his *Principles of Psychophysiology* (21) mention only Helmholtz. Freeman's *Introduction to Physiological Psychology* (8) has no mention of accommodation in the index. Rawdon-Smith's *Theories of Sensation* (19) is about like Ladd and Woodworth in this connection. Both Dunlap's *Elements of Psychology* (6) and Boring, Langfeld and Weld's *Psychology* (2) describe the Helmholtz theory as though it were a matter of established fact. Boring's *Sensation and Perception in the History of Experimental Psychology* (1) devotes 10 pages to the subject of accommodation, but never gets beyond the mention of Helmholtz's notion of the elastic lens.

There have been, however, a number of experiments reported in the last 40 years the results of which make it appear that the Helmholtz notion must be modified.

A general survey of the literature up to 12 years ago is provided by Duke-Elder in his *Recent Advances in Ophthalmology* (4), and his compendious *Textbook of Ophthalmology* (5). He cites the work of Fincham who showed that the lens itself is not elastic, but maintained, however, that the capsule was. He showed that the lens capsule is not of the same thickness at every point, being thickest at the shoulders, and thin at both posterior and anterior poles. This becomes important in terms of his findings as to the shape of curvature of the lens in accommodation. Fincham showed as Grossmann had done in 1904 (10) that in accommodation the lens thickens, but that at the anterior surface it assumes a hyperbolic curve with the apex rounded out, corresponding to the pupillary diameter. At the periphery it tends to flatten.

Duke-Elder also cites the work of Graves (9) who experimented upon a lens capsule which had been so injured that it was like an empty sack. He reported that when accommodated for distance, or under the effects of mydriatics, the lens capsule straightens out; but that when accommodated for near vision, or treated with eserine, the capsule wrinkles and folds, the posterior more than the anterior, like a slack sail.

It was shown by Johnson (12), contrary to Fincham's belief, that the lens does not appear to have great tension; if it is cut open it does not gape as it should, if elastic. He also reported that the fluids in the chambers apparently moved about, as could be seen following the injection of methylene blue into the chamber.

Duke-Elder summarizes as follows (5):

In the act of accommodation there is an increase of thickness and a decrease

in diameter of the lens, with, at the same time, a protrusion forwards of the center and a relative flattening of the periphery, the whole being accomplished by an axial movement of the lens substance which is evident particularly in the central regions (p. 745).

Further, he states the Helmholtz theory must be modified to take account of the hyperbolic form of the accommodated lens at the anterior surface, and the fact that the lens substance is not elastic (p. 747). He holds with Fincham that the lens capsule is elastic and responsible for the lens shape.

Edgar Fincham has published a number of careful and significant studies, most of which are brought together in a monograph with an extensive bibliography, published in 1937 (7). He points out that the ciliary muscle is not a true sphincter, but is made up of reticulated and not radial fibers. The lens is connected to the walls of the eye ball by the zonule and the vitreous humor; and the zonule is actually a modification of the vitreous as an elastic gel membrane, and not a system of inextensible fibers. The lens itself is of increasing hardness as the center is approached, due to a decrease in water content in the older tissues; and it also increases in refractive index. The lens, however, is not *elastic* as is shown when the substance is slipped out of the lens capsule. Fincham's evidence for the elasticity of the capsule makes it appear to be much less elastic than his enthusiasm for this property warrants. He offers four major facts. One is that if a strip of the capsule is cut, it coils outward, and if a wound is made, the capsule at the edges rolls outward and the lens substance protrudes. The second fact comes from two cases of aniridia, wherein the whole lens, the ciliary body and zonule were visible. In accommodation the apparent diameter of the lens is reduced, and there is a marked centripetal movement of the ciliary process, which is not visible in the unaccommodated state. The inward movement of the ciliary body is more than the amount of movement of the edge of the lens. The third fact is Graves' report (which is cited above) of the alteration of the lens capsule in accommodation, in which the lens had been dissolved. Finally, he reports the effect upon the lens of completely severing its connection with the zonule. In an eye of an 11 year old he removed the cornea and iris, and with a Graefe knife, loosed the lens; he also bisected the eye at the equator so that the anterior half was supported with the lens resting upon the vitreous humor. Thus, he finds, that before severing the zonule, the radius of curvature of the lens is about 12 mm., and after severing, the central part (3 mm.) has a radius of curvature of about 5 mm., while the periphery is still 12 mm. Such a conoidal form of lens surface, he demonstrates, is found only in cases where the anterior capsule has a relatively thin central area surrounded by a zone of greater thickness.

The evidence cited above seems not to be final, or crucial between the theories of Helmholtz and Tscherning. Although Duke-Elder, Fincham, and many others interpret this in terms of a modified Helmholtz view, it is interpreted to support Tscherning in a series of papers by Luedde (15, 16, 17, 18) and by Koke (13).

Luedde (16) points out that the vitreous humor has a structure and that it works on the lens not only through hydrostatic pressure. Thus, "when the vitreous pushes against the lens, with its mushy cortex and unyielding nucleus at its center, changes are likely to occur in the lens. The soft cortex will be pushed forward and axipetally, and increased convexity of the anterior surface will result. Under extreme accommodation the lens may shake and quiver, because it carries with it the attached body of the vitreous," and not because it is simply released from tension, as followers of Helmholtz would have it.

In his last paper, Luedde (18) presents some clinical material of considerable additional importance. He reports several cases of subluxated lenses which he treated. He had employed miotics to prevent a recurrence of prolapse of the lens into the anterior chamber. But the lens gradually displaced downward behind the iris. He discontinued the use of the drug, and the lens arose to the original position. He cites other cases, in all of which *the lens tends to be displaced in the direction of the section of the zonule which is left intact*. This cannot be accounted for, he maintains, by the theory that the zonule is *relaxed* from tension; the lens displacement he explains as a function of the action of the ciliary muscle which causes an impact by means of the vitreous humor against the periphery of the lens. He thinks that the vitreous slipped over the edge where the zonule was defective and caused the side-slip of the lens. But the clinching case, reported by his son, was a subluxation of a lens caused by a football injury. Iridodonesis was present when looking at a distant object, but stopped upon accommodation for near objects. He found that with the good eye, the boy's accommodation for near vision was 6 inches, but for the injured eye, only 9 inches. Obviously there could be no relaxation of tension in accommodation here.

An experimental study reported by Koke (13) seems also to be crucial. He made a cat's eye radiopaque by interocular injection of a colloidal suspension of thorium dioxide, and then took roentgenograms of the eye under the influence of different drugs. He describes in detail the structure of the vitreous humor. He maintains that during accommodation, changes are mostly found in the increased axial diameter of the lens and an axialward forward movement of the tertiary vitreous. He holds that the sphincter-like action of the ciliary muscle rolls the tertiary vitreous inward and upward against the center of the lens, and backward against the secondary vitreous nearer the periphery. The

secondary vitreous tends to expand at the ora serrata but is prevented from doing so by the attenuated posterior extremity of the ciliary muscle (p. 967).

During maximal accommodation the lens trembles on movements of the eye because the circular muscle fibers relax the anterior zonule more than the lens capsule constricts, leaving, as has been explained by Luedde, the lens to be supported only by the zonular fibers attached to the posterior portion of the ciliary epithelium (p. 968).

He concludes that in this cat eye, accommodation is brought about by compression of the posterior periphery of the lens when the tertiary vitreous is forced anteriorly and axialward by the ciliary muscle.

From these various studies it would seem justified to say that in certain respects both the Helmholtz and the Tscherning theories of accommodation are right. The lens itself is not elastic material; but the lens capsule has a structure such that it tends to shape the lens; and such that, when pressure is applied to it, it does not give uniformly. In the peripheral regions the greater thickness of the capsule acts as a stiffener, thus containing the bulge from the posterior pressure to the central anterior region, forming a *lenticonus*. When relaxed and accommodated for distance the lens seems to be under some flattening tension. But when the ciliary muscle contracts it does not simply release the tension on the zonule; it applies positive if indirect pressure against the lens through its action on the structured vitreous humor.

#### BIBLIOGRAPHY

1. BORING, E. G. *Sensation and perception in the history of experimental psychology*. New York: Appleton-Century, 1942.
2. BORING, E. G., LANGFELD, H. S., & WELD, H. P. *Psychology*. New York: John Wiley & Sons, 1935.
3. DASHIELL, F. *Fundamentals of objective psychology*. New York: Houghton Mifflin Co. 1928.
4. DUKE-ELDER, W. S. *Recent advances in ophthalmology*. (2nd Edition). London: J. & A. Churchill, 1929.
5. DUKE-ELDER, W. S. *Textbook of ophthalmology*, London: Kimpton, 1932, Vol. I.
6. DUNLAP, K. *Elements of psychology*. St. Louis: C. V. Mosby Co., 1936.
7. FINCHAM, E. The mechanism of accommodation. *Brit. J. Ophthal.*, 1937, Supp. 8. Pp. 80.
8. FREEMAN, G. L. *Introduction to physiological psychology*. New York: Ronald Press, 1934.
9. GRAVES, BASIL. The response of the lens capsule in the act of accommodation. *Trans. Amer. ophthal. Soc.*, 1925, 23, 184-198.
10. GROSSMANN, KARL. The mechanism of accommodation in man. *Ophthal. Rev.*, 1904, 23, 1-19.
11. HELMHOLTZ, H. V. *Treatise on physiological optics*. Southall, J. P. (Ed.). Opt. Soc. Amer., Philadelphia, 1924, Vol. 1.
12. JOHNSON, L. A new theory of accommodation. *Arch. Ophthal.*, 1924, 53, 426-430.

13. KOKE, M. P. Mechanism of accommodation. *Arch. Ophthalm.*, 1942, 27, 950-968.
14. LADD, G. T. & WOODWORTH, R. S. *Elements of physiological psychology*. (2nd Ed.). New York: Chas. Scribner's Sons, 1911.
15. LUEDDE, W. H. Hensen & Voelcker's experiments on the mechanism of accommodation: an interpretation. *Trans. Amer. ophthalm. Soc.*, 1927, 25, 250-267.
16. LUEDDE, W. H. The mechanism of accommodation. *Arch. Ophthalm. (Chi.)*, 1932, 7, 40-70.
17. LUEDDE, W. H. Lenticular accommodation. *Amer. J. Ophthalm.*, 1936, 19, 245-247.
18. LUEDDE, W. H. What subluxated lenses reveal about the mechanism of accommodation. *Amer. J. Ophthalm.*, 1941, 24, 40-45.
19. RAWDON-SMITH, A. F. *Theories of sensation*. Cambridge, 1938.
20. TROLAND, L. T. Vision. In Carl Murchison (Ed.) *Foundations of experimental psychology*. Worcester, Mass.: Clark University Press, 1929.
21. TROLAND, L. T. *The principles of psychophysiology*. Vol. 2, *Sensation*. New York: Van Nostrand, 1930.
22. TSCHERNING, M. The mechanism of accommodation. *Ophthalm. Rev.*, 1904, 23, 95-104.
23. TSCHERNING, M. *Hermann von Helmholtz und die Akkommodationstheorie*. Leipzig: Barth, 1910.
24. WOODWORTH, R. S. *Experimental psychology*. New York: Henry Holt, 1938.

## HULL'S TREATMENT OF LEARNING

BENBOW F. RITCHIE  
*University of California*

In a recent review of Hull's new book, *Principles of Behavior* (10) in the *Psychological Bulletin*, Professor Sigmund Koch (11) says: "It is one of the most important books published in psychology during the twentieth century" (11, p. 269). This statement is followed by fourteen successive pages of similarly unrestrained praise. The review closes with three pages of hesitant criticism. Professor Koch's enthusiasm seems to be based upon the belief that the book states "the *entire* postulate set tentatively believed to be capable of generating the major phenomena of organismic behavior" (11, p. 270). The review itself is primarily concerned with the logical elegance of Hull's system, and Professor Koch's few criticisms deal with certain logical or mathematical inelegancies. When, however, one considers the relation between Hull's system and the facts of learning which it is supposed to explain, enthusiastic praise seems out of place.

When the original announcement of Hull's book was made, one was led to expect a detailed analysis of the work of his critics, and a reformulation of his basic explanatory hypotheses so as to account for the experimental data which they had discovered. But this expectation was doomed to be disappointed. There are, for example, no references in Hull's book to the work of Muenzinger, Krechevsky, D. K. Adams, Brogden, Culler, Harlow, Hunter, Loucks, or Maier, to mention only the more prominent proponents of experiments which are critical of Hull's theories. This false expectation was furthered by the appearance, shortly before the publication of the *Principles*, of an article (9) in which Hull announced his adoption of (1) Tolman's program of molar as opposed to molecular analysis, and (2) Tolman's explanatory device which has been called the *intervening variable*.

But a mere cursory glance at Hull's *Principles* shows that his attempt at molar analysis is hardly thorough-going. Of the total number of experiments cited, 26 or 41% are of the classical Pavlovian type, using the psycho-galvanic reflex, salivation, or the eye-blink. On the other hand only 2 maze and 2 visual discrimination experiments are cited. Thus Hull seems to have become less, rather than more molar. Furthermore since his analysis is concerned with such small segments of behavior, there is no detailed discussion of his highly important and most controversial notions, such as the anticipatory goal response, the habit family hierarchy, and the goal gradient. Instead of analyzing these notions he casually uses them to explain any behavioral anomalies

which cannot be accounted for by simple effect or substitution principles.

Because Hull, in his search for formal elegance, has apparently ignored the work of his critics, his book has little to offer the student who is concerned with contemporary problems in learning theory. Although Hull makes several references to Hilgard and Marquis' *Conditioning and Learning* (6), he makes no attempt to solve any of the problems which that book presents for his theory. The chief defects in his theory of learning spring, I believe, from two sources, his molecular bias, and his inadequate treatment of reinforcement. Let us turn then to some of the basic problems in learning theory and examine Hull's treatment of them.

1. *Behavioral Oscillation and Response Generalization.* Perhaps the most striking evidence that Hull has become less rather than more molar is to be found in his treatment of response generalization. Previously he had dealt with this problem in terms of his notion of the habit family hierarchy (8). Each member of a habit family was thought of as a response sequence leading from a common starting place and ending at a common goal situation. "When one member of a habit family has attained a goal in an objectively novel situation," Hull said, "the learning thus acquired is transferred without specific practice to the remaining members of the hierarchy" (8, p. 41). Now there may be disagreement about the usefulness of such a molar concept, but certainly no one can deny that it is more molar than Hull's present notion of behavioral oscillation. Compare the quotation we have just cited with the following explanation of response generalization taken from the *Principles*.

The explanation lies in the tendency of the oscillation function to modify the intensity of every muscle contraction involved in every coordinated reaction. (10, p. 318).

Note also the following statement of what he means by the term *molar*, drawn from the same chapter.

The ultimate effector molar unit in habitual action is believed to be the individual muscle. This means not only that the action of each muscle in every coordinated movement must be mediated by a separate habit, but that every momentary phase of the contraction of every such muscle (since its proprioceptive cues are constantly changing) must be mediated by what in some sense is a different habit. (10, p. 315).

It is difficult to imagine how such a molecular notion could explain, say, the behavior of Lashley's (12) monkey which solved a problem of manipulation with its left hand, despite the fact that the right hand, the only one to receive any training, had been paralyzed by a brain operation. Such results as these are not scarce and seem to demand that we give up the notion of habits as simple receptor-effector connections.

This point was apparently recognized by Hull when he developed the habit family hierarchy notion. But in his *Principles* he has abandoned this program, and has regressed to a muscle-twitch *peripheralism* (2).

2. *Stimulus Patterning*. Just as Hull's "explanation" of response generalization reveals a peripheralism on the response side, so his "explanation" of stimulus patterning reveals a parallel peripheralism on the stimulus side.

The facts of stimulus patterning were first discovered in Pavlov's laboratory and were later confirmed by C. B. Woodbury (20) in the New Haven laboratory. Woodbury's experiment consisted in training dogs by differential reinforcement, to lift a bar (a la Skinner) when either a high or low buzzer sounded alone, but not to lift it when they sounded together. It is a little surprising, says Hull, that Pavlov "regarded patterning as an ultimate molar phenomenon and did not succeed in breaking it down into more elementary principles" (10, p. 354). No one, according to traditional conditioning theory, Hull implies, could explain how two conditioned stimuli in combination could lose their power to evoke a response, so long as each separately would still evoke it. Hull bases his explanation on his *principle of afferent neural interaction* which asserts that the afferent impulses from receptor discharges interact with each other so that each is changed by the pattern of the others. Thus the afferent impulse resulting from the high buzzer when sounded alone is different from the impulse produced by the same buzzer when it is sounded in combination with the low buzzer. If a response is conditioned to the solitary impulse it will at first generalize to the other similar impulse, and the response will be made to the compound. However, as a result of differential reinforcement the dog can learn to discriminate between these two afferent impulses, and thus respond to the stimulus, only when it is presented alone. This explanation of stimulus patterning is, says Hull, an answer to the criticisms of the configuration or *Gestalt* psychologists who take such patterning as logically primitive. As a consequence Hull thinks of it as an important new addition to behavior theory.

Unfortunately, however, neither the importance nor the novelty of this explanation are so obvious. To explain observable phenomena in terms of unobservable ones is often permissible and sometimes fruitful. But unobservable phenomena should not be confused with *uncontrollable* ones. Since we can control such unobservables as drive by maintenance schedule, or habit strength by training, we may employ these constructs as intervening variables to *explain* the gross behavior reported in our protocols. But in the principle of afferent neural interaction we have no way of estimating, for example, the degree of similarity between the compound afferent impulse and its component impulses

when taken separately. Any such estimation must perforce be ad hoc, and thus the principle appears to be what Spence (18) has rightly criticized as a *response inferred construct*. Therefore, we must conclude with Spence, that its explanatory value is negligible.

Secondly, Hull's explanation is hardly novel. In fact it does not seem to differ essentially from Pavlov's which emphasized "that a definite interaction takes place between different cells of the cortex resulting in a fusion or synthesis of their physiological activities on simultaneous excitation" (15, p. 144). It seems unfair therefore to say that Pavlov did not foresee Hull's explanation.

Finally the fact that Hull's treatment of this problem is not molar hardly needs mentioning. In fact, for the molar psychologist there is no problem in stimulus patterning. The compound of the two buzzers is a different physical object from either of them taken separately, and consequently learning to discriminate the compound from the other two objects is not theoretically different from any other learning of a discrimination.

3. *Conditioned Inhibition and Extinction*.—Most of the difficulties in Hull's *Principles* arise from two sources (1) its molecular bias, which we have described, and (2) its inadequate notion of reinforcement, which we will analyze later. His treatment of extinction and conditioned inhibition is important chiefly because it illustrates these sources of difficulty.

Extinction is explained in terms of the Mowrer-Miller hypothesis of reactive inhibition (13, 14). According to this hypothesis whenever a response occurs there is deposited "in the physical structures involved in the evocation, a state or substance which acts directly to inhibit the evocation" (10, p. 297) of this response when its stimulus is again presented. Reinforcement cannot destroy or remove this reactive inhibition, which continues to accumulate with each repetition of the response. It is only dissipated when the effector organs are allowed to rest and the "inhibitory substance is gradually removed by the blood stream passing through these organs." (10, p. 281). Hull emphasizes that such inhibition is opposed to reaction potential and not to habit strength, which is not weakened by extinction. That is, it is the response and *not* the connection between the stimulus and this response which is weakened. Extinction is thus primarily motivational in nature and is not like "forgetting" since the habit remains unimpaired. With an increase in motivation for example, the reaction potential of an extinguished response is increased, and the response reappears.

Habits are involved, however, in *conditioned inhibition*, a process closely allied to extinction. Hull's *explanation* of it is strangely recondite. Reactive inhibition, he now asserts, is a primary *negative motiva-*

*tional state* (10, p. 281), which is analogous to tissue injury or pain. Consequently with the cessation of reactive inhibition we should expect to have a reinforcing state of affairs. He goes on

The response process which would be most closely associated with such a reinforcing state of affairs would obviously be the cessation of the activity itself. In accordance with the law of reinforcement this cessation of activity would be conditioned to any afferent stimulus impulses, or stimulus traces, which chanced to be present at the time the need decrement occurred. Consequently there would arise the somewhat paradoxical phenomenon of a negative habit, *i.e.*, a habit of *not* doing something. (10, p. 282).

This new *habit* is in conflict with the old one, and as its strength increases, it overtakes and outruns it. In this sense then, conditioned inhibition is closer to *forgetting* than extinction since it is a special case of counter-conditioning in which the new habit is a habit of *not* doing something.

The hypothesis that extinction is probably motivational in nature lies at the basis of every adaptation theory of extinction. And for such an hypothesis there seems to be much evidence. But Hull has failed to see that this hypothesis is incompatible with his molecular notion of habit. That is, he completely ignores the logical difficulty in maintaining that a receptor-effector connection (a habit) can remain unchanged when properties of its effector are changed (*i.e.*, the reaction potential is reduced). As a consequence if Hull is to retain his interpretation of extinction, he must abandon (1) his notion of habit as a connection between receptor and effector events, and (2) his notion that reinforcement strengthens such connections. In a later section of this paper we will discuss this difficulty in greater detail.

All that one can conclude from Hull's *explanation* of conditioned inhibition is that his notion of reinforcement is confused. Reactive inhibition, one must remember, is only dissipated by being *gradually* washed away by the blood stream, a process which takes many hours. The cessation of this state, says Hull, constitutes a reinforcing state of affairs. But if the gradient of reinforcement is limited, as Hull says, to 20 or 30 seconds, it is impossible to understand how removal of this state could be a reinforcing agent. This confusion is even further increased by the ambiguity in the phrase *cessation of activity*. This might mean (1) a single act of restraining the old response, or (2) the fact that the response will not be repeated for many hours. If Hull means the first, then it is clear that this response of restraint could not be reinforced by a process which occurs only after many hours. If he means the second, then there is nothing to explain, since he has already assumed that the habit-of-not-making-the-old-response has already been acquired.

4. *Primary Reinforcement and Avoidance Learning.* Since Hull's law of primary reinforcement is based upon the Thorndikian law of effect, it is interesting to examine his account of avoidance learning. Hilgard and Marquis (6) have shown that the traditional formulations of effect have not been able to explain such learning. Briefly put the problem is this. Although the shock is an essential condition in acquiring the avoidance response, once this response has been acquired, reinforcement consists in *not* getting the shock. Hull does not discuss this point, but instead presents two paradigmatic experiments, intended to exemplify the nature of primary reinforcement.

The first such experiment involves escape learning. A rat is put in a box with electric grid floors. This box is divided into two compartments by a little fence, so that if the rat is to get from one compartment to the other he must jump the fence. After the rat is put in the box, the experimenter throws a switch which charges the floor on which the rat is standing. The rat's behavior changes immediately. Hull says

In place of the deliberately exploratory movements, it now displays an exaggeratedly mincing form of locomotion . . . interspersed with occasional slight squeaks, biting of the bars which are shocking its feet, defecation, urination, and leaps up the walls. These reactions are repeated in various orders and in various parts of the compartment; sometimes the same act occurs several times in succession, sometimes not. After five or six minutes of this variable behavior, one of the leaps carries the animal over the barrier to the uncharged grid of the second compartment. (10, p. 70).

As this procedure is repeated the rat learns to jump over the barrier the instant the grid is charged.

Hull analyzes this situation as a case of selective learning in which one unlearned receptor-effector connection (leaping over the barrier) is made stronger than its competitors. Of the variety of competing responses,  $R_1$  (leaping against the walls),  $R_2$  (squeaking),  $R_3$  (biting the floor), and  $R_4$  (leaping over the barrier), the last is strengthened on each trial while the others remain at their initial strength. Each of these competing responses was originally evoked by (a) the conditions of need resulting from electric shocks on the feet, and (b) stimulation (visual, cutaneous, etc.) arising from the apparatus at about the time the reaction took place. Hull says

This stimulation, arising from the apparatus at the time of the respective reactions needs to be designated specifically; leaping against the walls will be represented by  $S_A$ ; biting by  $S_{A'}$ ; squeaking by  $S_{A''}$ ; and the leaping of the barrier by  $S_{A'''}$ . It is assumed that preceding the learning, the leaping of the barrier was evoked by a compound connection between the receptor discharges  $S_D$  (internal drive stimulus) and  $S_{A'''}$ , arising from  $S_D$  and  $S_{A'''}$  respectively. (10, p. 71).

Hull then explains the differential strengthening of the correct response in terms of the following law of reinforcement:

Whenever a reaction takes place in temporal contiguity with an afferent impulse resulting from an impact upon a receptor of a stimulus energy, and this connection is followed closely by the diminution in a need (and the associated diminution in the drive, and in the drive receptor discharge), there will be a resultant increment in the tendency for that stimulus on subsequent occasions to evoke that reaction. (10, p. 71).

The second paradigmatic experiment involves avoidance learning. The procedure is the same one as in the preceding experiment with the exception that two seconds before the shock, a buzzer is sounded. Selective learning proceeds as before, but ends with the animal jumping as soon as the buzzer sounds, thus avoiding the shock. This learning is, in principle, says Hull, exactly the same as the previous kind of learning. The reinforcement again consists in the termination of a need. Hull explains the fact that the animal does not have to wait for the shock to occur, by saying that the S-R connections between buzzer-and-jump and between  $S_A$ ---and-jump summate physiologically and thus become strong enough to evoke the jumping response without the shock.

It is difficult to see that Hull's account of primary reinforcement represents any improvement over Thorndike's. It still fails to explain why the avoidance response does not extinguish once the animal has learned to avoid the shock. Since he defines reinforcement as a reduction in a need, it is necessary that the rat have some need reduced after each repetition of the correct response, if the reaction potential is not to decrease and end in extinction. Previously, Hull (7, 8) used the notion of  $r_g$  to account for this, although that explanation was also inadequate, since it failed similarly to explain why the  $r_g$  continued to be evoked without reinforcement. Perhaps because of this difficulty he has given up the  $r_g$ s, but as far as I can see he has not here found a better solution to the problem.

Furthermore Hull's insistence that such learning involves differential strengthening of certain receptor-effector connections seems merely to make his theory of reinforcement less plausible than the traditional one. The stimuli which Hull supposes arise from the apparatus and evoke the various unlearned responses, are inferred solely from these responses. They are not themselves observable, or at least they are not experimentally controllable. Consequently they have a dubious status as constructs. Other proponents of effect theories, such as Thorndike and Skinner have avoided this difficulty. Thorndike avoids it by saying that all the competing responses are initiated by the same stimulus. Skinner avoids the difficulty by saying that they are operant re-

sponses which need no external stimuli to instigate them. But Hull supposes that the stimulus for squeaking, for example, is different from the stimulus for jumping the barrier. There is, as he puts it, the stimulus "which arises from the apparatus at the time of" squeaking, and another stimulus which arises at the time of leaping the barrier. This ambiguous statement leads the reader to suppose that perhaps the only stimuli which are peculiar to the leaping response are those proprioceptive and exteroceptive stimuli which result when the animal makes the response. Of course Hull does not state this to be his meaning, but it is difficult to conceive of any other way of distinguishing these stimuli. But this interpretation makes the explanation completely circular, since the stimulus which is supposed to evoke the leaping response, only occurs after the response has been made. The other alternative, namely Thorndike's solution, which states that the external stimulus is the same for all the responses, is not compatible with Hull's theory. The reason is that all four of the unlearned habits would then be reinforced because of their close temporal contiguity to the reinforcement, and consequently the incorrect ones would tend not to be eliminated.

5. *Secondary Reinforcement.* Hull recognizes that direct or primary reinforcement will not account for a "very great deal of learning" (10, p. 84). Perin's experiments (16), on the temporal gradient of reinforcement in the Skinner box situation, show that this gradient is limited to 20 or 30 seconds. Consequently, Hull says, a new principle is needed to explain the learning of long sequences of behavior (e.g. in mazes) where direct reinforcement cannot be effective. "Fortunately," says Hull, "an ingenious series of experiments performed in Pavlov's laboratory in Petrograd has yielded a principle which explains these remote reinforcements." (10, p. 84). He then describes in detail Frolov's experimental discovery of higher order conditioning. Dogs learned to salivate to a black square which had never been followed by food, but had instead been followed by a metronome which elicited conditioned salivation because of previous training in which it had been followed by food. This experiment, according to Hull, "demonstrates in an unambiguous manner the genuineness of secondary reinforcement, a first rate scientific achievement" (10, p. 86).

Hull goes on to describe other experimental illustrations of such secondary reinforcement. Skinner (17), for example, trained rats to press a lever when it was reinforced not with food, but with a click in the food-release mechanism, which by previous training had been associated with food. Bugelski (1) showed that the rate of extinction was retarded when such a click followed the lever pressing, although no food was delivered. Further examples are found in Cowles' (3) token experiments with apes,

and Grindley's (5) experiment in which he taught young chicks to go down a runway and peck at grains of boiled rice which were covered by a glass plate.

But none of these experiments according to Hull "prove that secondary reinforcement is a genuine phenomenon." In order to prove *that*, "it is necessary to remove all possibility of primary reinforcement from the situation" (10, p. 94). However, when we do this, the primary receptor-effector connection extinguishes, and the secondary reinforcing agent becomes impotent. Because of this fact Pavlov believed that conditionings above the third order were impossible. Thus, none of these experimental illustrations provide evidence of stable learning in which the effect of direct reinforcement is completely removed. However, Hull says

We now have evidence, that in protracted behavior sequences, even with primary reinforcement fully intact, the direct effects of the latter are automatically excluded from all receptor-effector conjunctions beyond a half minute or so from the point of such reinforcement. . . . It follows that the strength of the earlier segments of such sequences must frequently be maintained by very long chains of secondary reinforcing situations. (10, p. 94).

This *explanation* of secondary reinforcement certainly seems circular. As he states it, his original problem is to find an explanatory principle which will account for the learning of protracted behavior sequences in which the earlier segments lie outside the gradient of primary reinforcement. He then described one higher order conditioning experiment, and several secondary reward experiments. But since none of these yield an instance of learning which is unambiguously independent of primary reinforcement they are not satisfactory. Finally, the only conclusive evidence of the *genuineness* of secondary reinforcement is the fact that animals can learn such protracted behavior sequences.

Perhaps the real trouble with this argument is that Hull is not clear about the nature of an explanatory principle. Hilgard and Marquis (6) for example, distinguish three such principles, substitution, effect, and expectancy. They do not point out, however, that the first two of these principles differ from the last one in an extremely important way. Both substitution and effect state, or attempt to state, the necessary and sufficient conditions for the acquisition of a new habit (however that term is to be defined). Substitution states that temporal contiguity between the conditioned and unconditioned stimulus is the only relevant condition. Effect, on the other hand, states that the critical condition for learning is the temporal contiguity between the occurrence of the response to be learned and the reduction in a need. The principle of expectancy, on the other hand, states that an expectation of "this-leading-to-that" is the necessary and sufficient condition for learning, but it

fails to state the conditions leading to such an expectation. In this sense the expectancy principle is fundamentally different from either substitution or effect. The importance of the expectancy principle lies in its emphasis upon the role of attention (as in Krechevsky's theory of discrimination learning) and the role of spatial orientation (as in the latent learning experiments). But the principle of expectancy will only become explanatory when it has become possible to state the conditions leading to such attention, orientation, and whatever other factors may prove relevant.

Thus, Hull's explanation of maze learning in terms of secondary reinforcement is, strictly speaking, empirically equivalent to Tolman's explanation in terms of expectation. Both serve to point out that neither the principle of substitution nor the principle of effect are adequate. But neither Hull nor Tolman can state the necessary and sufficient conditions for the occurrence of such expectations or such secondary reinforcements. Despite this similarity between Hull and Tolman there remains, however, an important difference. Tolman recognizes that expectancy is not an explanatory principle, but rather is merely a device for "casting one's concepts into a mold such that one can derive useful preliminary hunches from one's own human, everyday experience. These hunches may then, later, be translated into objective terms" (19, p. 24). By this means Tolman believes that we may be able to discover the conditions which determine attention, spatial orientation and so forth. Hull, on the other hand, since he seems to conceive of his principle as explanatory leaves the reader with the notion that nothing remains to be done but to express it in mathematical form.

In some terminal notes Hull considers the possibility that primary and secondary reinforcement are at bottom the same. Although the ultimate proof must be physiological, he suggests that an analysis in terms of fractional anticipatory goal responses seems to indicate a basic identity between the two kinds of reinforcement. The basic assumption of this analysis is that

the first secondary reinforcing stimulus acquires its power of reinforcement by virtue of having conditioned to it some fractional component of the need reduction process of the goal situation *whose occurrence wherever it takes place, has a specific power of reinforcing in a degree proportionate to the intensity of that occurrence.* (10, p. 100).

But this analysis is inadequate since it cannot explain the elimination of errors. Because the goal component response is conditioned to the drive stimulus it is independent of external supports and may occur anywhere in the maze. It may occur in the blinds as well as in the true path. Since this is the case, the responses which carry a rat into a blind are just as likely to be reinforced as those which carry it into the true

path. Previously Hull tried to meet this difficulty by saying that the goal component responses on the true path were stronger and more frequent than those in the blinds because of their greater proximity to the goal. But this explanation is based on the assumption that the gradient of primary reinforcement operates throughout the entire maze, an assumption which Hull no longer considers tenable.

6. *Habit Strength, Reaction Potential, and Reinforcement.* So far we have examined some of the more important difficulties which result from trying to account for molar behavior in terms of a molecular notion of habit combined with a Thorndikian notion of reinforcement. In a molar psychology like Tolman's such problems do not arise. Basic to a theory like Tolman's is Elliott's (4) distinction between learning and performance, as exemplified in the phenomenon of *latent* learning. This idea emphasizes that what is learned is not a tendency to respond in some particular way, but rather, is a *cognitive* grasp of certain means-end-relations. Consequently, whenever the animal is motivated in such a way that certain objects in this means-end field become goals, the animal then performs, by responding in a way that is directed or determined by the character of the means-end relations which were acquired during the "latent" learning period. Although such a theory may face new difficulties of its own, it does obviate most of those which face a theory like Hull's.

Hull's distinction between habit strength and reaction potential was probably conceived to serve the same purpose as the distinction between learning and performance. In fact the idea of reaction potential may have been derived from a suggestion made by Tolman (19) in his presidential address. In that paper Tolman said:

So long as there is no appetite for what is found at the end of the maze, strong demands plus strong hypotheses do not add up at all. A strong hypothesis and a strong demand do not compensate for a weak appetite. And a strong demand and a strong appetite cannot in their turn overcome a weak hypothesis. (19, p. 21).

Hull, agreeing with this suggestion (whether stimulated by it or not), devotes a chapter to pointing out that an active motive must be present for a stimulus to evoke its response. Such response evocation is a multiplicative and not an additive function of the drive and the habit strength, so that *reaction potential, the tendency to produce the response*, is defined as the product formed by multiplying the strength of the drive by habit strength. Thus the tendency to make the response is a direct function of the amount of motivation and of learning at the time the stimulus is presented. If either of these is zero, the reaction potential will be zero.

Such a conception is very useful to Hull since it enables him to ac-

count for much of the experimental data which Tolman and others have emphasized. But unfortunately if Hull is to use this distinction, he must revise his notions of habit and reinforcement. Reinforcement, according to Hull, produces an increase in habit strength or an increase in the "tendency for an afferent impulse on later occasions to evoke that reaction" (10, p. 178). While habit on the other hand is defined as this receptor-effector connection. Now in terms of these two notions, observe the logical difficulty involved in his explanation of experimental extinction. Hull says that during extinction the habit strength remains unchanged while the reaction potential is weakened. When "translated" this means that the habit (i.e., the tendency of a particular afferent impulse to evoke its habitual reaction) remains unchanged, while the reaction potential (i.e., the tendency to this same habitual reaction) decreases. Clearly this is contradictory. Therefore, if Hull is to make his theory consistent he must either give up the notion of reaction potential, or completely revise his ideas about habit and reinforcement.

Professor Koch says

It is easy to point to many aspects of the system which are incomplete, based upon tenuous experimental foundations, or lacking in rigor. But in most cases this would not be news for Hull. So clearly is Hull aware of the *provisional* character of his formulation, and the presence in the system of many open questions, that one hesitates to raise critical points. (11, p. 283).

But, easy as it is to discover the faults in Hull's system, it is not a simple matter to correct them. The criticisms raised in the present paper are certainly not novel. If Hull has followed the discussions of his theories, which have filled the journals since 1930, he must certainly be familiar with all these difficulties. But to change his system to account for these criticisms probably would mean such a radical revision of the foundations that there would be little left upon which to build.

Hull and his students have constantly criticized other psychologists, like Tolman, for being purely programmatic in their theorizing. There is some justification in this complaint. But the reason that other psychologists are less specific in their theoretical suggestions is perhaps because they are more aware of the difficulties. In fact, most of the *programmatic* psychologists suspect that the facts of learning cannot be described or explained in simple S-R terms. At present they are searching for new molar concepts which will take account of the relevant facts, and at the same time will have the inter-subjectivity of reference that was the chief merit of the original behaviorist conception of stimulus and response.

#### BIBLIOGRAPHY

1. BUGELSKI, R. Extinction with and without sub-goal reinforcement. *J. Comp. Psychol.*, 1938, 26, 121-133.

2. BRUNSWIK, E. Organismic achievement and environmental probability. *Psychol. Rev.*, 1943, 50, 255-272.
3. COWLES, J. T. Food-tokens as incentives for learning by chimpanzees. *Comp. Psychol. Monogr.*, 1937, 14, No. 5.
4. ELLIOTT, M. H. Some determining factors in maze performance. *Amer. J. Psychol.*, 1930, 42, 315-317.
5. GRINDLEY, G. C. Experiments on the influence on the amount of learning in young chickens. *Brit. J. Psychol.*, 1929, 20, 173-180.
6. HILGARD, E. R. AND MARQUIS, D. G. *Conditioning and learning*. New York: Appleton-Century, 1940.
7. HULL, C. L. Goal attraction and directing ideas conceived as habit phenomena. *Psychol. Rev.*, 1931, 38, 487-506.
8. HULL, C. L. The concept of the habit-family hierarchy and maze learning. *Psychol. Rev.*, 1934, 41, 33-52; 134-152.
9. HULL, C. L. The problem of intervening variables in molar behavior theory. *Psychol. Rev.*, 1943, 50, 273-291.
10. HULL, C. L. *Principles of behavior*. New York: Appleton-Century, 1943.
11. KOCH, SIGMUND. Hull's Principles of Behavior. *Psychol. Bull.*, 1944, 41, 269-286.
12. LASHLEY, K. S. Studies of cerebral function in learning. V. The retention of motor habits after destruction of the so-called motor area in primates. *Arch. Neurol. Psychiat.*, Chicago, 12, 249-276.
13. MILLER, N. E. & DOLLARD, J. *Social learning and imitation*. New Haven: Yale Univ. Press, 1941.
14. MOWRER, O. H. & JONES, H. M. Extinction and behavior variability as functions of effortfulness of task. (In press):
15. PAVLOV, I. P. *Conditioned reflexes*. (Trans. by G. V. Anrep). London: Oxford Univ. Press, 1927.
16. PERIN, C. T. The effect of delayed reinforcement upon the differentiation of bar responses in white rats. *J. exper. Psychol.*, 1943, 32, 95-109.
17. SKINNER, B. F. *The behavior of organisms*. New York: Appleton-Century, 1938.
18. SPENCE, K. W. The nature of theory construction in contemporary psychology. *Psychol. Rev.*, 1944, 51, 47-68.
19. TOLMAN, E. C. The determiners of behavior at a choice point. *Psychol. Rev.*, 1938, 45, 1-41.
20. WOODBURY, C. B. The learning of stimulus patterns by dogs. *J. comp. Psychol.*, 1943, 35, 29-40.

## PSYCHOLOGY AND THE WAR

Edited by

DONALD G. MARQUIS

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### POST-WAR REEMPLOYMENT PROSPECTS IN PSYCHOLOGY

DONALD G. MARQUIS

*Office of Psychological Personnel*

During the period of occupational readjustment following the termination of World War II approximately one-half of the total number of psychologists will change their employment. Most psychologists have been too busy during the war years to give more than a passing thought to this problem—but that passing thought has often been tinged with apprehension about their personal prospects in the grand reshuffling. Some individuals, anticipating a great oversupply of trained psychologists, are looking for opportunities in new lines of work. Others are confident that the demonstrated utility of applied psychology in wartime service will create vast new opportunities with employment for all.

In order to provide an estimate of the magnitude of the reemployment problem and a basis for planning measures to deal with the problem, a survey of the post-war plans of all psychologists was undertaken in January 1944 by the Office of Psychological Personnel. Questionnaires were mailed to members of all psychological societies and to all who had registered with the National Roster of Scientific and Specialized Personnel or the Office of Psychological Personnel and who met the minimum requirements for associate membership in the American Psychological Association—a total of 4553 men and women. Returns were received from 84 per cent, with even better return from those in military service than from civilians. Some of the data obtained have been pub-

lished in an article on the mobilization of psychologists for war service (3), which also contains a description of the technique of the survey.

At the time the survey was carried out there were 986 psychologists in the armed forces and 276 more employed as civilians by federal war agencies, including those working full-time under contract with the Office of Scientific Research and Development. Many others had shifted to new and temporary civilian positions to fill critical vacancies and to carry out the special assignments associated with the Army Specialized Training Program in the colleges and universities. Only one-half have remained in their regular positions.

Table I presents a summary of the post-war plans of psychologists as

TABLE I  
INDIVIDUAL POST-WAR PLANS OF PSYCHOLOGISTS

	Army	Navy	Civilian	Total
Continue in present position	17	5	2254	2276
Return to previous position	210	116	225	551
Attend graduate school	183	46	190	419
Seek a new position	265	144	898	1307
<i>Total</i>	675	311	3567	4553

expressed in their replies to the survey questionnaire. The frequencies have been corrected from the total returns of 3824 to correspond to the total population of 4553. In addition to the number who will continue in their present position, return to a position from which they are on leave, or attend graduate schools, there are 1307 persons who indicate that they will be seeking new positions. The primary question is whether or not there will be 1307 positions available.

#### ESTIMATION OF POST-WAR EMPLOYMENT

To estimate the number of available post-war jobs is difficult. The employment situation in psychology will naturally reflect the general economic condition of the country, but current predictions on this point do not have sufficient reliability to justify their consideration here. It is manifestly impossible to question each employer of psychologists on his post-war needs, and it is unlikely that he would be able to make a good estimate now. It is unfair to take the present level of civilian employment as a basis because so many vacancies are necessarily unfilled. It is equally unfair to base estimates on the employment levels in pre-war years, because of the steady progressive growth in the size of the pro-

fession, independent of strictly wartime increments. During the past fifteen years the number of employed psychologists has increased by approximately nine per cent each year, and this rate of growth has been maintained through the war years. The small decline in the num-

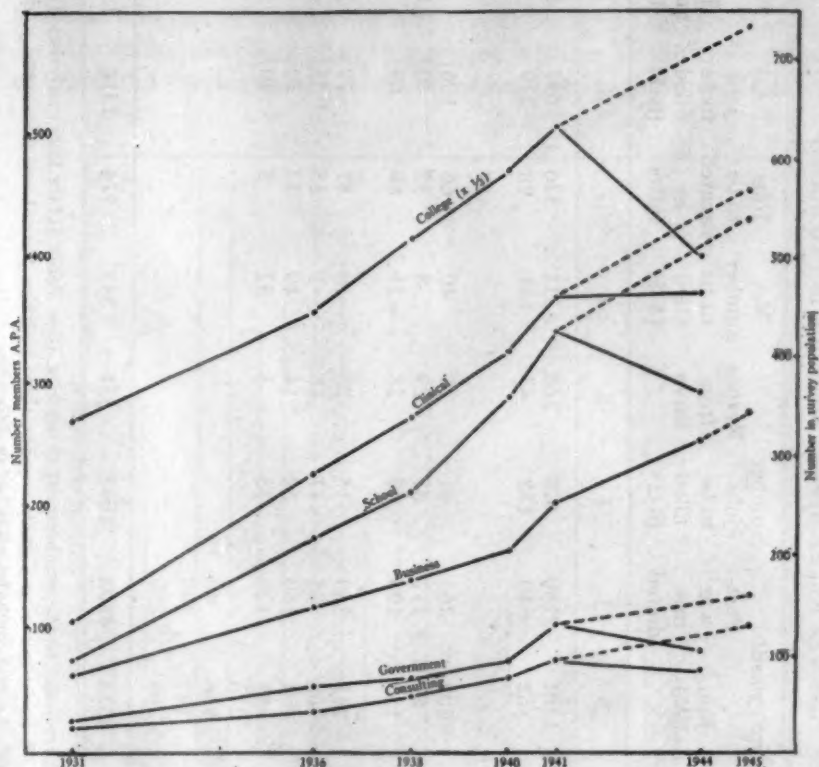


FIGURE 1. EMPLOYMENT TRENDS IN PSYCHOLOGY.

The frequencies for college employment have been divided by three in order to bring them within convenient range for this plot. Data for the years 1941 and 1944 are from the present survey; data for 1931 to 1940 are from Finch and Odoroff (1, 2), recategorized on the basis of original data supplied by Dr. Finch. The scale at the left is the one used by Finch and Odoroff whose count was based on APA membership. The scale at the right is for the larger population of the present survey which included 747 psychologists who are not APA members. The scales are adjusted in proportion (1.00 to 1.25) so that the trends will be continuous.

ber entering the profession from graduate schools is offset by those who have been recruited from bordering fields.

The best estimate of the post-war employment level should then be secured by an extrapolation of the regular growth in the several occupational categories. The survey provides employment data for January

TABLE II  
ANALYSIS OF THE POST-WAR REEMPLOYMENT SITUATION IN PSYCHOLOGY

	Employment		Post-war pre-dicted	Number jobs to be filled (3-2)	Return from leave	Net number to be filled (4-5)	Jobs to be vacated by shifts	Total jobs to be filled (6-7)	Job preference of those seeking new positions*	
	Jan. 1941	Jan. 1944							1st	2nd
Column	1	2	3	4	5	6	7	8	9	10
Universities and colleges	1875	1501	2180	679	368	311	336	647	721	375
Schools and educational systems	424	362	540	188	47	141	98	239	52	137
Clinical positions										
Guidance centers, clinics, agencies	215	202	263	61	21	40	66	106		
Prisons, correctional institutions	96	80	117	37	29	8	32	40		
Hospitals, custodial institutions	146	183	190	7	28	-21	80	59	198	349
Business										
Industry and business	178	245	260	15	25	-10	87	77	241	318
Public personnel agencies	73	68	85	17	16	1	35	35		
Government agencies	127	104	160	54	14	40	32	72	95	128
Self-employed (consulting)	96	85	120	35	3	32	8	40		
Federal war agencies	11	276								
Military service	11	986	40							
Advanced graduate students	274	197	580							
Non-employed or no information	272	264	268							
Total	3798	4553	4803	1093	551	542	774	1316	1307	1307

\* The preferences have been regrouped to correspond to the employment categories. (See Table III for finer analysis.) The first figure includes preferences for college teaching and for college personnel and guidance; the third includes clinical and vocational guidance; the fourth includes industrial research and personnel work; the fifth includes all other preferences.

1944 and January 1941, and fortunately comparable data\* for previous years are available in two published analyses by Finch and Odoroff (1, 2).

Figure 2 presents the overall picture obtained by combination of the two sets of data. The extrapolation to values for 1945 is by visual inspection and can be checked by any reader using the same means.

It is quite justifiably open to question whether or not the usual rate of growth of employment opportunities has been maintained in the war

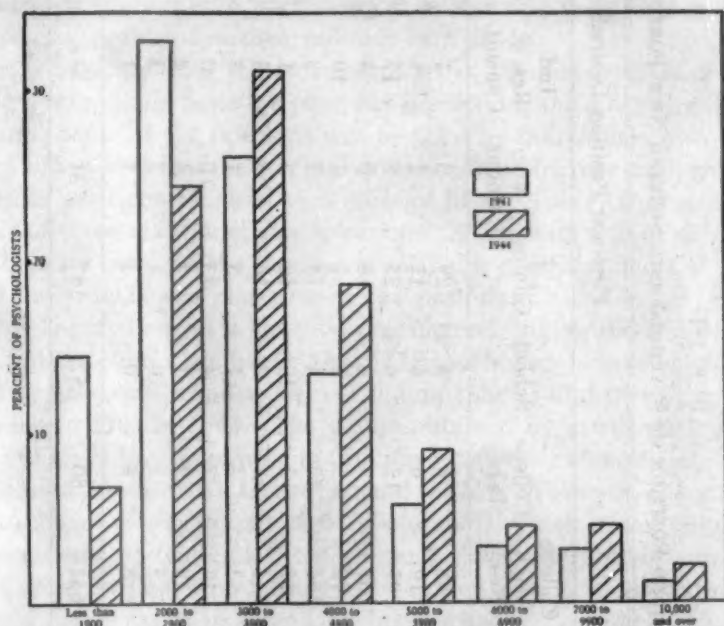


FIGURE 2. COMPARISON OF SALARIES OF PSYCHOLOGISTS IN 1941 AND 1944.

years. Growth of a profession such as psychology depends upon the summation of activities of individual psychologists in creating through their work an expanding need for more psychologists. There has been a necessary curtailment of such activities in civilian occupations during the war, and the shortage of trained personnel has made it necessary in

\* The categories of employment used in the analysis of the results in the present survey are not identical with those used by Finch and Odoroff in their published papers. Dr. Finch has very kindly furnished me with a much finer breakdown of his data into 23 categories, by the recombination of which it has been possible to secure comparable groupings.

TABLE III  
PRESENT OCCUPATION AND DESIRED POSITION OF PSYCHOLOGISTS SEEKING NEW POST-WAR EMPLOYMENT

Present Occupation	Post-war Position Desired							Total
	College Teach. Res.	College Pers.	School	Clinical	Voc. Couns.	Ind. Res. & Consult.	Ind. Public Pers.	
Student	58	8	4	29	3	1	3	113
Not employed	19	6	4	11	1	1	10	60
Military—commissioned	97	17	6	25	8	17	86	283
Military—non-commissioned	161	9	4	18	0	8	18	226
Federal war agencies	72	5	2	7	1	10	20	129
College or university	164	20	4	13	2	3	12	229
Schools and educational systems	17	2	19	12	2	1	4	61
Guidance centers, clinics, agencies	4	2	3	16	5	3	2	39
Prisons	3	2	1	3	1	3	5	20
Hospitals	14	2	4	23	0	0	2	25
Industry and business	19	2	1	7	4	2	16	56
Public personnel	5	1	0	1	3	3	7	20
Government agencies	8	4	0	2	1	1	3	19
Total	641	80	52	167	31	53	188	1307

many instances to forego plans for development of enlarged programs. It is not possible to estimate how great such deferred needs will be, or how completely they will become filled after the war. With respect to college teaching, however, which represents the greatest latent demand, there is good reason for optimism. The provision of federal funds for veterans' education, and the backlog of students drawn into military service, make it clear that there will be a great increase in college enrollments after the war. It is expected, furthermore, that college students will desire instruction in psychology to a greater degree than before because of their contact with psychological service and their awareness of psychological problems in their military experience.

If it is assumed that the extrapolations of the employment trends provide a reasonable basis for post-war prediction, the story is still incomplete. Some of the positions will be filled by individuals who were granted leaves of absence; other individuals who desire new employment will vacate positions which in turn must be filled. Table II presents an analysis of these additional considerations and permits a final estimate of the balance between the number of available positions and the total of 1307 individuals who plan to seek new positions.

Table II may be read in the following manner, taking the first row as an example. Column 1 indicates that 1875 psychologists were employed in 1941 by universities and colleges. Column 2 shows that there has been a decrease to 1501 in 1944. The values obtained by extrapolating the trends of Figure 1 are presented in Column 3, and the excess of Column 3 over Column 2 indicates a latent demand for 679. However, 368 intend to return to university employment (Column 5), which leaves only 311 positions available (Column 6). Column 7 shows the present employment of those civilians who are intending to seek new positions, to return to former positions, or to attend graduate school. There are 336 such positions in colleges which are now filled by temporary appointments and which will be vacated in the post-war shifting. When this number is added to Column 6 a total is obtained of 647 positions which need to be filled. Columns 9 and 10 present the preferences of the 1307 individuals who intend to seek new jobs. There is a fortunate agreement between the jobs available and jobs sought in the college field.

The principal conclusion from an examination of Table II is that there should be enough jobs for all who want them. The total of 1316 positions to be filled is balanced against the total of 1307 individuals seeking jobs. There is also reasonable agreement within the separate occupational categories, with two exceptions. It will be necessary to resort to second choices to fill the positions in school psychology, while the desire for jobs in business and industry far outruns the indicated demand.

## POST-WAR SUPPLY OF PSYCHOLOGISTS

The data from the survey questionnaire provide a certain amount of information about the 1307 individuals who indicated that they would seek new positions after the war. Their present occupation is given in Table III with an analysis of their job preferences.

The group is predominantly young. Half of them completed their graduate training in 1939 or later; three-fourths, in 1936 or later. Women constitute 31 per cent of the group.

There is another source of potential psychologists which is not included in the present survey. The Army has given training and practical experience in personnel procedures to a large number of men assigned as classification specialists and personnel consultants. The amount of psychological training presented in the AGD schools for enlisted men and officer candidates is not great, but the practical experience in testing, interviewing and classification has in some instances at least aroused an interest in post-war employment in personnel work, vocational guidance or industrial counseling. The extent of this interest cannot be estimated, but it is likely that such persons will not become identified with psychology unless they elect to take graduate training.

The Army Specialized Training Program, however, provided intensive psychological training for about 1350 enlisted men. This training was carried out in 11 universities by the regular faculty of the psychology departments. The instruction was comparable in scope to two regular quarters of graduate work. The men are therefore in a position to compete for employment in psychology with regular students with the M.A. degree. It becomes a matter of interest to know the post-war plans of this group.

A special survey of the graduates of the ASTP course was carried out in 1943-44. Addresses were not available for all and returns were received from a total of 673. Only 30 of the entire group had enough previous graduate work in psychology to qualify for associate membership in the A.P.A., and they were included in the major survey of psychologists. The analysis of the pre-war occupation and the post-war plans of the total group is presented in Table IV. It is apparent that the ASTP training has influenced about half the group to change their post-war plans to some form of psychological occupation.

If it should develop that more than 600 new psychologists have been created by the ASTP, it will become a matter of interest to know their specific intentions. According to the survey returns, 230 intend to enroll in graduate school, 290 prefer jobs in industrial personnel work, 65 would like to work in vocational guidance, and 25 plan to enter college teaching. Other preferences are scattered among several occupational categories.

## NEW EMPLOYMENT OPPORTUNITIES

It would be unreasonable to expect any sudden spurt in post-war employment in the college, school, or clinical fields. The expansion of these sources of employment is limited by the relatively stable number

TABLE IV  
POST-WAR PLANS OF GRADUATES OF THE ASTP ADVANCED  
PERSONNEL PSYCHOLOGY COURSE

	Pre-War Occupation		Desired Post-War Occupation	
	Psychology	Other fields	Psychology	Other fields
Undergraduate student	1.1%	9.6%	6.7%	8.3%
Graduate student	.7	2.3	17.1	10.6
Employed	7.4	78.9	33.0	24.3
<i>Total</i>	9.2	90.8	56.8	43.2

of employing agencies and by their financial capacity to hire additional psychologists. A more flexible situation exists in the fields of personnel work in business, industry and public agencies, and in vocational guidance.

Business and industry offer fields with almost unlimited possibilities for development. Psychologists now occupy only a minute fraction of the positions in personnel work and employee counseling. There is good reason to believe that if more trained psychologists were available, more positions would become available.

The Veterans Administration has need for 200-400 trained vocational counselors at salaries of \$2600, \$3200 and \$3800. These men and women will work in association with newly established college centers for the examination and vocational counseling of disabled veterans. Because the present supply of qualified counselors is so limited, the agency is attempting to postpone filling as many of the positions as possible until the period of demobilization.

It is fortunate that the expansible fields in psychology are just the ones for which experience in military psychology is most valuable. Business and industry will want men with backgrounds in testing, classification and personnel work; the Veterans Administration and similar agencies will want men with military experience in testing and clinical psychology.

## POST-WAR SALARY LEVELS

It is commonly recognized that wartime salaries for civilian professional workers are higher than pre-war levels. Although most college and university salaries are fairly stable, the critical shortage of trained psychologists has resulted in higher salaries in government agencies and in business and industry. Other employers in hospitals, clinics, schools and colleges have found it necessary to offer somewhat increased salaries in order to fill their vacancies.

Figure 2 presents a comparison of the distribution of salaries in 1941 and 1944. The median salary increased from \$3100 to \$3500 during this period. These figures represent all employed psychologists exclusive of students and those in military service. The data were obtained from the survey described above. The salary question was answered by 86 per cent of all who returned questionnaires.

Readjustment of salary schedules after the war is inevitable, but it is hoped that some of the gain of the past three years can be maintained.

## GRADUATE SCHOOL ENROLMENT

A large increase in the number of graduate students in psychology can be expected after the war. Some estimate of the magnitude of the increase is essential for the most effective planning of programs by graduate departments. An inquiry was sent in May of this year to the chairmen of 77 departments which offer graduate instruction in psychology. Replies were received from 72, and reasonable estimates were made for the remaining five.

Graduate school enrolment has been reduced to approximately one half from 1941 to 1944. The inquiry shows that there were 1181 students in January 1941, a figure which agrees closely with the total of 1131 derived by the National Roster of Scientific and Specialized Personnel in a careful and complete count of all colleges for May 1942. In January 1944 our inquiry showed that there were 665 students or 56 per cent of the pre-war number. A similar estimate of the decrease in enrolment can be derived from the number of degrees granted. In 1941 there were 117 Ph.D. degrees; in 1944 there were 63.

It can be anticipated that the present level of graduate school enrolment will be maintained until the period of demobilization, since most departments are now reduced to their limit. There are several reasons for anticipating a marked increase in the number of graduate students after the war. Table I indicates that 229 persons whose education was interrupted by military service will return to graduate school, and that 190 more who have taken jobs during the war will likewise return. Table IV indicates that 230 graduates of the ASTP course in Advanced Per-

sonnel Psychology intend to enrol for graduate work. These figures alone indicate an enrolment of 1314, but additional considerations make it necessary to formulate an even higher estimate. There is an ever increasing backlog of college graduates and near graduates who will enter graduate school when their military service is terminated. This group was not reached in any of the surveys and is not included in the figures above. Some of such men may have had Army experience in personnel work, and if we can judge from the ASTP survey, the number who are interested in a career in psychology will be larger than usual. A final factor of major importance will be the financial aid extended by Public Law 346 (G.I. Bill of Rights) to veterans returning to school. This will also be of help to departments facing an increased number of student applications with limited funds for scholarships and assistantships.

## BIBLIOGRAPHY

1. FINCH, F. H. & ODOROFF, M. E. Employment trends in applied psychology. *J. Consult. Psychol.*, 1939, 3, 118-122.
2. FINCH, F. H. & ODOROFF, M. E. Employment trends in applied psychology, II. *J. consult. Psychol.*, 1941, 5, 275-278.
3. MARQUIS, D. G. The mobilization of psychologists for war service. *Psychol. Bull.*, 1944, 41, 469-473.

## PSYCHOLOGICAL WORK IN THE UNITED STATES MARITIME SERVICE

CHARLES C. LIMBURG

*Lieutenant Commander, United States Maritime Service*

The American Merchant Marine is now engaged in the greatest transportation job ever undertaken in the history of the world. This job is being done without fanfare by citizens of the United States in a civilian status.

The American Merchant Marine consists of:

*Ships.* At the outbreak of war in December, 1941, the United States had 1150 passenger liners, freighters, colliers and tankers, a total of 10,500,000 deadweight tons. In the period from January 1, 1942 to July 1, 1944 the number of ships built totaled 3,506 with a deadweight tonnage of 35,955,900.

*Officers and Men.* In peacetime approximately 50,000 officers and seamen were employed on our merchant ships. Since it requires a crew of approximately 45 to man the average vessel, it has been necessary to man the added vessels with experienced seamen returning to the industry or with inexperienced men newly trained for the work to be done.

*Management.* Several score steamship companies own or operate all the vessels in the American Merchant Marine, except for those now being used by the Army and Navy. All of the privately-owned vessels are now under the control of the War Shipping Administration which requisitioned them for emergency use. In most cases the vessels have been reallocated for management and operation to their original owners who act as agents for the government. New vessels built by the War Shipping Administration also are turned over to private companies for management and operation.

*Government Agencies.* Prior to the war, the U. S. Maritime Commission under the Chairmanship of Vice Admiral Emory S. Land, U.S.N. (Retired) was responsible for measures designed to improve the American Merchant Marine. The wartime functions of the U. S. Maritime Commission were transferred to the War Shipping Administration of which Admiral Land is Administrator, when this agency was established on July 11, 1942 upon Executive Order of the President.

In order to understand the relation of the government to the American Merchant Marine a brief historical note may be helpful. After several half-measures, the Congress of the United States took cognizance of the decrepit state of American shipping and passed the Merchant Marine Act of 1936. This Act defines the policy of the Congress with reference to the status of our Merchant Marine and contains a passage which has come to be known as the Magna Charta of the Merchant Marine which reads as follows:

It is necessary for the national defense and development of its foreign and domestic commerce that the United States shall have a merchant marine (a) sufficient to carry its domestic water-borne commerce and a substantial portion of the water-borne export and import foreign commerce of the United States

and to provide shipping service on all routes essential for maintaining the flow of such domestic and foreign water-borne commerce at all times, (b) capable of serving as a naval and military auxiliary in time of war or national emergency; (c) owned and operated under the United States flag by citizens of the United States insofar as may be practicable, and (d) composed of the best-equipped, safest and most suitable types of vessels, constructed in the United States and manned with a trained and efficient citizen personnel. It is hereby declared to be the policy of the United States to foster the development and encourage the maintenance of such a merchant marine.

The Merchant Marine Act of 1936 established the United States Maritime Commission. The United States Maritime Service was established by the U. S. Maritime Commission in 1938 pursuant to authority of the Merchant Marine Act of 1936, as amended. During the period from March 1, 1942 to July 11, 1942, the United States Maritime Service was briefly administered through the United States Coast Guard. Training facilities were established to train merchant seamen, experienced or inexperienced to man the ships of the merchant fleet. Parallelizing a U. S. Maritime Commission shipbuilding program aimed at replacing the veteran vessels of our decadent merchant marine, young Americans were recruited for service and placed aboard new ships after receiving approximately a year's training. As the clouds of World War II crowded the horizon and the necessity of a new large merchant marine became more and more evident, more training stations were opened and the length of the training offered was reduced in accordance with war-time conditions.

Presently under the cognizance of the War Shipping Administration, the United States Maritime Service is a voluntary, non-military organization intended to furnish training and other benefits for personnel of the United States Merchant Marine. Upon completion of training, enrollees are released to inactive duty for service aboard merchant ships. The Commandant of the U. S. Maritime Service is Rear Admiral A. B. Randall, U.S.N.R. (Retired). Administrative personnel and trainees are enrolled in the Maritime Service in the same ranks, grades and rates prescribed by law for the U. S. Coast Guard. Training stations and ships are maintained for apprentice seamen and for officers. Apprentice seaman training consists of a period of preliminary training in general and safety seamanship (boot training) required of inexperienced personnel followed by branch training in the deck, engine and stewards departments. Specialist schools are conducted for radio operators, cooks and bakers, pursers, pharmacist's mates, and the various specialist ratings in the deck and engine departments. Officers schools conduct separate courses for deck and engine officer candidates with special courses of instruction being provided in such fields as diesel engineering, turbo-electric drive, etc. In addition, various upgrading facilities are provided.

Responsible officers in the U. S. Maritime Service were quick to recognize the potential contribution to the training program which could be made by administrative personnel with a background of psychological training. Accordingly, soon after the Maritime Service was transferred from the United States Maritime Commission to the Training Organization of the War Shipping Administration, an officer was attached to Headquarters for the purpose of developing the program. The keynote of this program emphasized intelligent action by officers thoroughly experienced in psychological procedures and techniques relating to indoctrination, classification, teaching and training, selection for specialized training, and problems of personal adjustment. The operation of this program is briefly summarized in a job analysis schedule for Classification and Selection Officers attached to all training stations.

### UNITED STATES MARITIME SERVICE

#### JOB ANALYSIS SCHEDULE

1. *Job Title:* Classification and Selection Officer.
2. *Alternate Titles:* Station Psychologist; Educational Officer.
3. *Department:* Training.
4. *Job Summary:* Directs the administration of classification and selection procedures in training station: (1) screens out and recommends disenrollment of mentally inept enrollees who are unsuitable for training; (2) orients trainees with respect to opportunities for training and placement; (3) supervises the administration of aptitude tests; (4) collects supplementary classification and selection data; (5) interviews enrollees for purpose of classification, selection, and guidance; (6) selects qualified enrollees for branch training, special schools and administrative duty; (7) acts as adjustment counselor; (8) develops and supervises the administration of objective achievement tests during training; (9) assists in instructor training; (10) prepares statistical and narrative reports of activities; (11) introduces new classification and selection procedures as prescribed by Headquarters; (12) lectures on educational and personal adjustment subjects; (13) attends staff conferences; (14) prepares pertinent correspondence; (15) may stand collateral duty as Educational Officer in indoctrination and examination for promotion of administrative personnel; (16) may stand collateral station and departmental watches and inspections; (17) may march in reviews.
5. *Supervision Received:* Administrative from Station Training Officer; technical and professional from Headquarters Classification and Selection Officer.
6. *Supervision Given:* Classification and Selection personnel.
7. *Educational Requirements:* Ph.D. or equivalent in psychology or related fields.
8. *License and Certificate Requirements:* None.
9. *Experience Requirements:* Broad practical experience in fields of clinical and educational psychology, training methods, psychometric methods, personnel work, statistics and administration.
10. *Promotion Requirements:* (1) Professional and technical proficiency; (2) Maritime Service Instructions (Regulations); (3) Minimum service requirement in grade; (4) Satisfactory efficiency reports.

11. *Job Knowledge*: (1) General and specific information relating to all aspects of duties outlined under job summary; (2) relation of Maritime Service training courses to merchant marine ratings; (3) requirements for enrollment, transfer, upgrading and release to inactive duty; (4) pay and supply instructions; (5) intimate familiarity with Headquarters and station directives governing policy and operations.

12. *Responsibility*: (1) For promotion, development and efficient operation of Classification and Selection program in his unit according to professional standards; (2) for most effective use of available manpower; (3) for keeping abreast of events and techniques relating to his field in other services; (4) for intelligent use of materials at hand; (5) for security of all confidential and restricted information and materials relating to his department; (6) for collaboration with all department and section heads as may be required.

13. *Physical Requirements*: (1) Maritime Service administrative duty standards; (2) physical fitness, since duties require him to be alert, aggressive and personable.

14. *Equipment*: Office equipment; classification and selection forms, orientation materials, aptitude and achievement tests; test scoring and calculating machines; manuals.

15. *Comments*: This schedule outlined herein may vary from station to station depending upon the size and function of the station.

In addition to work done by psychologists acting as Classification and Selection officers, the U. S. Maritime Service utilizes the services of men with psychological training and experience in a special developmental unit. Inasmuch as the Maritime Service is almost exclusively concerned with the recruitment, classification and training of men for service aboard merchant vessels, it has been considered advantageous to establish a Personnel Procedures Unit. The function of this Unit is believed to be somewhat similar to both the Personnel Research Section of the Adjutant General's Office of the Army and to the Standards and Curriculum Section of the Navy. The present functions of the Personnel Procedures Unit in the Maritime Service may be outlined briefly as follows:

1. To conduct organizational surveys of Maritime Service Units as required and to analyze all ranks and grades in the Maritime Service for the purpose of preparing job specifications for use in recruitment, selection, training, upgrading, and related functions.

2. To develop personnel forms used in the recruitment, assignment to duty, and transfer of administrative personnel and to maintain a central file of personnel classifications within restricted areas.

3. To coordinate and assist in the administration of educational programs designed exclusively for administrative personnel and to collect, revise and distribute indoctrination materials for use in all Maritime Service Units.

4. To prepare standard promotion examination procedures for use with all Maritime Service enlisted personnel assigned to administrative duty.

5. To develop new classification and selection techniques and procedures for use with all trainees who are processed by Classification and Selection Officers.

The work of the U. S. Maritime Service and of the U. S. Maritime Commission will continue after the war. In this respect, Admiral Land has summed up the policy as follows:

There can be no question about our post-war objectives. They are clearly defined not only by the Merchant Marine Act of 1936, but by the now rapidly reshaping world situation. Our goal is to have the best ships in the world and as many of them as any other nation. We must plan, too, so that those ships shall carry a sufficient portion of world trade to restore the United States to a Maritime position befitting a nation of her status. Never again must we allow our merchant marine to become the Nation's cross-eyed stepchild.

## PSYCHOLOGY AND THE WAR: NOTES

*Advisory Board on Clinical Psychology.* In connection with the recent establishment of a clinical psychological program in the hospitals of the Army, Lieutenant Colonel MORTON A. SEIDENFELD has been designated as Chief Clinical Psychologist and Captain JON EISENSEN as Assistant Chief in the Classification and Replacement Branch of the Adjutant General's Office.

To advise The Adjutant General on matters of policy and procedure in connection with this program, an Advisory Board on Clinical Psychology has been appointed by the National Research Council, with DR. WALTER V. BINGHAM serving as Chairman. Psychiatrists and psychologists on this Board include ARTHUR H. RUGGLES, M.D., Butler Hospital, Providence, Rhode Island; FRANK FREMONT-SMITH, M.D., Josiah Macy, Jr., Foundation; LAWRENCE S. KUBIE, M.D., College of Physicians and Surgeons, Columbia University; DR. MILES MURPHY, University of Pennsylvania; DR. FREDERICK LYMAN WELLS, Harvard University; DR. ROBERT R. SEARS, University of Iowa; and DR. DAVID RAPAPORT, Chief Psychologist, Menninger Clinic, Topeka, Kansas.

*OWI Psychology Newsletter.* The disruption in the normal system of international communications has cut many scientists off from news of the outside world. To combat this, The Overseas Branch of the Office of War Information has instituted monthly newsletters in a number of fields such as Psychology, Physics, Medicine, etc. These newsletters are reproduced by a photo-offset process on thin paper, and are distributed to OWI offices and U. S. Foreign Service posts throughout the world. The overseas staffs then make the material available in translation to interested people. The South American countries are covered by a special arrangement with the Office of the Coordinator for Inter-American Affairs.

The Psychology Newsletter is released under the authority of the American Psychological Association. It is prepared at Brown University, with the aid of galley proofs of the *Psychological Abstracts*. Dr. Ansbacher prepared the first 12 numbers, and Dr. Schlosberg has carried it on during the last year. A typical letter consists of digests of 10 important American contributions to the field of psychology, and is 400 abstract lines in length. An effort is made to distribute these digests evenly over the various sub-fields.

The letter is written for psychologists, psychiatrists, and educators. There is no way of knowing how many people actually see the Psychology Newsletter, but there are clear indications that it is widely read. The OWI considers the newsletters to be among its most successful ventures.

The newsletters are not generally available in this country, because of legal restrictions on domestic distribution of material sponsored by the OWI's Overseas Branch. Copies are on file in the office of the Secretary and of the *Psychological Abstracts*. Carbons of the manuscripts are now sent (informally, by the writer) to Miss Van de Water of Science Service for her use, and several of the digests have been rewritten for release through Science Service.—HAROLD SCHLOSBERG (*Brown University*).

## BOOK REVIEWS

MORGAN, C. T. *Physiological psychology*. New York: McGraw-Hill, 1943. Pp. xii + 623.

Psychophysiology has recently become the scene of intensified activity. The number of workers engaged in the study of psychophysiological problems has greatly increased. New techniques have been developed and applied to psychophysiological problems, and a large body of new data has accumulated. Acquired largely through the study of individual problems, these data need to be coordinated and to be integrated with the body of already existing facts in this general field. Dr. Morgan's new *Physiological Psychology* constitutes a preliminary attempt to meet this need.

The materials are organized with respect to twenty-six, essentially psychological, chapter-headings. The author's plan of treatment seems to be two-fold: (1) to summarize the various experimental data which fall under each general heading, and (2) to evaluate views that have been expressed regarding mechanisms that are conceived to be involved when the given phenomena are eventuated. The definition submitted for physiological psychology—the study of the physiological mechanisms of behavior—seems to emphasize the second aspect of this plan, but the text makes clear that physiological mechanisms are of interest as a means to the elucidation of the relevant phenomena.

The scope of psychophysiology is here broadly conceived. The first five chapters are devoted to historical introduction, cellular functions, internal environment, nerve cell functions, and nervous system. Chapters 6 and 7 are concerned respectively with phylogenetic and ontogenetic development. Chapters 8-14 deal with the various senses; chapters 15-22, with diverse motor phenomena; and chapters 23-26, with motor and discriminative learning, memory, and symbolic processes. Even if unsettled problems are neglected, this classification embraces most of the problems in which activity has been accelerated in recent years.

The treatment in the chapters concerning the several senses is notably different. Although the problem of quality is specifically considered in all of these chapters, and in some cases specific versus non-specific views are contrasted, quantitative laws are presented only for vision and hearing. Quantitative relations which have been determined in the other senses, e.g. regarding sensitivity, adaptation, intensity discrimination, acuity, are not specifically treated. The several varieties of visual acuity are not differentiated, and an extensive literature on tactual acuity, containing significant physiological meaning, is not included.

Students will search this book in vain for a general discussion of one of the earliest of psychophysiological problems to be subjected to thoroughgoing investigation, i.e. space perception. This topic now embraces an extensive literature in which many of the involved physiological mechanisms, e.g. accommodation, light reflex, image formation, are fairly well understood, while others, e.g. size constancy, visual acuity, binocular fusion, are the basis of much theoretical conjecture. In view of these facts, and the author's expressed intent, it is not easy to defend the author's omission of this problem.

In the opening sentence of the preface, the author expresses his intention to prepare a work that will suit the needs of widely different classes of students—undergraduate and graduate students, and workers in the special fields of psychology, physiology, and medicine. Truly, it would be a triumphant achieve-

ment if the extensive literature on general psychophysiology were to be successfully condensed for these diverse groups in a volume whose text and 176 illustrations cover only 567 pages. Although the appended bibliography contains 980 references, it nevertheless fails to include many important studies in physiological psychology which are indispensable to the needs of the graduate student, let alone the more advanced specialist. The present work would serve the needs of undergraduates better if the treatment were less encumbered with conflicting theoretical discussions.

A chief end-in-view in the successive chapters avowedly is the delineation of the physiological mechanisms which are involved when given sensory and motor phenomena are elicited. The characterizations in most cases, however, are not very detailed. Incidentally, Dr. Morgan is in error when he gives chief credit to Crozier for the principle of neural availability; the idea is Holway's, not Crozier's. The principle (neural availability) has been studied and developed by both of these investigators, and by others, but most of the work was inspired or directed by the originator. In the chapters on learning, memory, and symbolic processes, the physiological interpretations are largely theoretical, comprising essentially the presentation of such views as have been advocated by authorities to account for a restricted body of psychological and/or psychophysical data. In other chapters, where data which have been obtained through the use of the newer physiological techniques are utilized as a supplement to existing psychological and psychophysical information, the physiological interpretations are carried somewhat farther. These differences are perhaps inevitable, owing to differences in progress in the various reaches of this branch of science.

Dr. Morgan's interpretations concerning physiological mechanisms are sometimes suggestive and the reviewer wishes that a more thoroughgoing effort in this respect had been made. There is ample reason to justify the expectation that the mechanisms for many phenomena might have been given in greater detail. The author's bibliography includes many references to studies in which the neural events associated with the eventuation of diverse aspects of behavior are already available in some detail. If these data had been brought to light in connection with the development of his conception of the internal environment, a more unitary development of the way that external conditions (the stimulus) influence behavior through differential action in the internal environment might have been achieved.

Much additional information will, of course, be needed before the nature of mechanisms involved in the elicitation of diverse forms of sensory and motor phenomena can be given in detail. However, newer methods which have recently been used to disclose the nature of certain biochemical reactions that are associated with sensory and motor items are promising. Using the well-known conception of the internal environment, Dr. Morgan has prepared the general ground for the study of these reactions. What is needed now is a detailed analysis of the diverse modes of chemical and physical interchange which take place in the organism via intercommunications among nervous, muscular, circulatory, digestive, and respiratory systems. This constitutes one of the most inviting and interesting tasks in present-day science.

MICHAEL J. ZIGLER

Wellesley College

DAVIDSON, HELEN H. *Personality and economic background: a study of highly intelligent children*. New York: King's Crown Press, 1943. Pp. 189.

In this monograph two purposes are clearly set forth: to describe the per-

sonality of gifted children who differ in socio-economic background, and to discover the extent to which personality differences are related to background differences. Since much of the content is technical, and the approach scholarly rather than popular, the book is apparently intended for teachers and students in the fields of psychology, sociology, economics, and education.

After careful consideration of available indices, income was selected as the measure of socio-economic status. Personality traits were measured by means of the Rorschach Test, the P.E.A. Scale of Beliefs, the Minnesota Scale for Survey of Opinions, the P.E.A. Interest Index, and Hildreth's Personality and Interest Inventory. Other data were collected by means of a miscellaneous questionnaire, school achievement records, the new Stanford Achievement Tests, and the Stanford-Binet Intelligence Test. The selection of tests followed after a survey of available instruments, and a competent digest of relevant literature.

The subjects in the investigation were 102 children nine to fourteen years of age, 49 in the Speyer School and 53 in the Lincoln School in New York City. All the children had IQ's over 120. The income groups represented ranged from under \$1500 to over \$10,000 per year. Mrs. Davidson found this group as variable in measured personality as any ordinary group, in spite of the relative homogeneity in IQ. However, very little relationship was found between socio-economic background and personality type or traits.

Some of the interesting findings were in the nature of exceptions to the above-mentioned general conclusion. Income was significantly related to general responsiveness to stimuli, ability to think as ordinary people do, liberalism in social issues, preferences for games and sports, choice of newspapers and magazines, extent and nature of dreams, fears, wishes and worries, and experiences in taking paid lessons in art and music, as well as type of summer vacation experience.

These bright children tended to be well adjusted, but more often in an introverted than in an extraverted way. The poorer ones were more often mal-adjusted. Girls were more often extraverted. Those in the middle income groups seemed best adjusted. Liberalism was markedly correlated with mental age. There was a marked negative correlation, even in this group, between income and economic liberalism. In general, the children were characterized by good morale, good personal adjustment, and harmonious family relationships. According to the inventory, they showed only a moderate interest in school subjects, and relatively little interest in science, foreign languages, and mathematics. The school achievement of the group was far beyond their chronological age norms.

The lack of relationship of personality traits to income is adequately discussed, and the possible significance of the age of the children pointed out. The group of bright children is well worthy of study, but perhaps a 9-14 year old group is least likely to be deeply affected by economic circumstances. The children were well aware of existing social problems, but had nothing to offer in the way of solutions; this is not surprising, of course, as one does not expect even bright children to reconstruct a culture, or to go far beyond their elders, their teachers, and their social and political leaders.

The worries of the poorer children indicated a need for instruction as to economical means of securing higher education. As further implications for education, the author suggests: that school experiences should be broadened to offer to all the opportunity to experience games and sports of all kinds; that the better magazines and newspapers should be provided for all; that much talent

now wasted might be developed through instruction in various arts; that summer vacations might be arranged for all; that these aims might be realized either through use of existing agencies or through setting up of agencies in the schools.

The material is competently handled throughout. Even the reprehensible accomplishment quotient is used without error and forced to yield some dividends.

One may say, in final summary, that we have here a unified and forceful study, competently done, presenting new material concerning bright children, and contributing interesting specific insights into a number of problems recognized as important in psychology today.

HAROLD D. CARTER

*University of California*

McMURRY, R. N. *Handling personality adjustment in industry*. New York: Harpers, 1944. Pp. xi + 297.

This volume is a timely one for it comes at a moment when industry is forced to recruit the marginal worker and is faced with the problem of hiring or re-employing the returning veteran who may be temporarily unstable or neurotic.

The treatment, directed toward management, consists of four parts: (1) labor problems, (2) the problem employee, (3) selection problems, and (4) training problems, and may be briefly summarized as follows: Job dissatisfaction occurs because of personality friction between employees and supervisors or executives, weak or inconsistent company policy reflected in first line supervisors, the totalitarian structure of industrial organization with consequent aggressive outlet upon the employee, and lack of opportunity for the expression of grievances.

The function of the labor union is to provide "a source of security, a punitive instrument, and a device to promote self-interest and a means of freeing the worker from guilt and responsibility." Good will and morale can be built by the "cathartic" method, the use of sports to relieve hostile tensions, by stimulating plant competition, and by displacing hostilities upon a common enemy—for example, the Japs. Employee participation in departmental administration is also advocated.

The number of problem employees—that is, vocationally or emotionally maladjusted—are estimated as nearly one-third of all gainfully employed. Five patterns of personality maladjustment are encountered in industry: "(1) *excessive preoccupation with the self* (extreme introvert traits); (2) *attacks on the things and persons of the environment*; (3) *aggressions which are turned inward upon the self* (self-punishments; purposive accidents, alcoholism, and self-induced failure); (4) *passive, dependent traits* (inability to find or hold a job); and (5) *compensations* for insecurities and inadequacies."

Job success depends upon (1) intelligence, skills, aptitudes, and (2) personality makeup and motivation. The latter is often of greater importance than the former. Three basic types of selection techniques are advocated: (1) the weighted application blank, (2) psychological tests, (3) the standardized or planned interview. The interview is the best means of measuring personality adjustment and motivation. Satisfactory and unsatisfactory employees in the plant should be studied to determine the traits that make for success and these findings applied in interpreting the results of the standardized interview. The home should be visited and studied for home adjustment has a bearing on work

adjustment. The total findings can then be used in rejecting the undesirable applicants and in selectively placing within the plant those accepted. Where the labor market does not permit rejection of applicants, the interview findings permit specific cautions to be taken in regard to potential weaknesses of the applicants hired.

Training helps the employee in adjusting to his job as well as in improving his skills. Before training can be effective, the employee must be convinced that it will help him personally. The subject matter must be attuned to the level of those to be taught and the material must not be presented too rapidly. Trainees should understand the reasons for rules or operations taught them and the final test of achievement is whether they can communicate matter learned to others. The conference method should be used.

In considering this work, it is evident that the author's intention was to apply the principles and techniques of clinical psychology and psychiatry to the adjustment of the problem employee in industry. This attempt has been only partially successful for general and specific reasons. There is no consistent and organized psychological approach to personality problems although psychoanalytic concepts are most frequently borrowed. All maladjustments in industry are ordered to a half-dozen or so clinical concepts—hostility, immaturity aggression, insecurity, inadequacy, guilt—and these are used comprehensively and indiscriminately without regard to individual differences. While the formulations apply to some maladjusted workers, they in turn do not apply to others. There is a tendency toward generalization which is unwarranted even within the non-experimental structure of clinical methodology. For example: "In most disputes, neither the employees nor their representatives are greatly concerned with the justice of their demands. Their aims are primarily punitive. They hate the company and seek only to make it suffer and pay" (31). Again, "... many of the misfortunes which beset the problem employee, both on and off the job, are expressions of self-punishing and self-destructive tendencies within himself" (76). Schizophrenia is defined as the final stage or extreme of introversion and the implication is given that such conditions are common in industry (77). It is a well known fact and reiterated by K. E. Markuson and A. L. Brooks that psychoses are relatively uncommon in industry.

With the exception of a list of reading references, documentation of the general clinical psychological and psychiatric literature is largely absent. Missing also are references to the existing industrial hygiene and psychiatric literature.

In the discussion of selection techniques, personality or temperament tests are curtly dismissed—despite the growing literature—on the grounds that the employees are not always truthful in answering the questions.

The techniques to be employed in correcting personality maladjustments in industry are superficial. While the author agrees that attitudes and habits have to be altered, with the exception of outlining in-service training courses for the improvement of skills, little information is given as to the manner of achieving this. Catharsis in a variety of forms is used as the *sine qua non* of therapy and little provision is made for a planned employee counseling program or of referral to community agencies or other community resources.

Thirty-three pages of the book—a part of the chapter on the training of interviewers—consists of a miniature psychiatric manual designed to train personnel interviewers in the theory of personality. In presenting this outline, it is the author's contention that psychologists or psychiatrists are not required

to administer the counseling program and that personnel men can be satisfactorily trained to handle the maladjusted workers. While the latter point can certainly be disputed, it is not a matter of conjecture that an abridged psychiatric text is not within the scope of a work of this nature particularly when personnel men can be referred to any number of excellent texts in the field.

The author should be commended for his attempt to fill a well defined need in industry but it cannot be said that the need has been adequately filled.

ARTHUR BURTON

*California State Personnel Board*

SARGENT, H. STANFELD. *The basic teachings of the great psychologists*. New York: Garden City Publishing Co., 1944. Pp. xiv + 346.

The title of this book might suggest something other than it is—a book written for the lay reader or possibly the former student who may want some book of a “refresher” nature. The book is designed to give an introduction to the whole sweep of psychological science. It purposes to accomplish this end by setting down in brief summarizing statements and paragraphs the major experimental findings, theories, and hypotheses that have accumulated throughout psychology’s history. A sample of the topics included in the book’s 20 chapters gives an indication of its scope: The schools of psychology, psychological measurement, heredity and environment in development, motivation, personality, abnormal psychology, social psychology, learning, perceiving, thinking, and psychology in everyday living. The lay reader will find the book interestingly written, he will view a panorama of psychological theories, a stage peopled by a galaxy of psychologists, philosophers, sociologists, medical men, social workers, and criminologists. He will find in the last pages brief biographical notes on 262 of the men presented in which their chief work or contribution is cited. The print is clear and easily read. The book is inexpensively bound and sells for a nominal price.

The psychologist, not being a lay reader in the field, can hardly evaluate the book as the layman might. The present reviewer can report the comments of two laymen with whom he discussed the book. The first refused to read it because he “would want something more than short, snappy statements that probably conceal as much as they reveal of the type of thinking, the pros and cons lying back of the statements.” The second, after reading the chapter on heredity and environment, was impressed with the fact that the stated conclusions did not seem to be backed by adequate experimental proof.

The psychologist will find the following faults with the book. The term “basic teachings” is really a misnomer in the sense that it should refer to the pervasive and fundamental principles which form the main structural features of a systematic presentation. In the book the “basic teachings” boil down too often to single sentence formulations of experimental findings. Again, the expression “great psychologists” is misleading. There simply are not 262 “great” psychologists in the history of psychology in the usually accepted sense of the word. The book indiscriminately mixes sociologists, philosophers, social workers, anatomists, and at least one (da Vinci) who is better known as an artist, with psychologists. The reader cannot determine from the text which are the “great” and which are the “near-great.” The psychologist will miss the surge of controversy, the ebb and flow of psychological opinion that constitute the fabric of psychology as he knows it to be. He will not, therefore, be in-

terested in reading the book and probably will question whether the lay reader will profit much from its study.

R. H. WATERS

*University of Arkansas*

VARIOUS. *The march of medicine*. New York Academy of Medicine Lectures to the Laity, 1942, No. VII, 1943, No. VIII. New York: Columbia Univ. Press, 1943. Pp. x+217; Pp. ix+151.

"The scope of the *Lectures to the Laity* on the art and romance of medicine has been greatly enlarged since their inception nine years ago. This broadened base now includes lectures on Nature and human behavior, both normal and abnormal, in the individual and in the mass, morals, philosophy, and world crises" (No. VIII, vi). This announcement should make the psychologist feel very much at home, and indeed he is not disappointed. Glancing over the table of contents he finds few subjects of purely medical interest. He is reassured by titles dealing with child development, genius, psychoanalysis and crime. Although the topics are purposely diversified they are united in the purpose of interpreting the findings of medicine to the layman for the betterment of his world. Various social schemes are proposed in the name of science. For example, in *Nature and Man*, R. R. Williams suggests a return to the rugged individualism of the frontier to allow the operation of the law of natural selection in human society. Labor unions, corporations, and "government guarantees of freedom from want" would all be liquidated and the individual forced to struggle for existence. Dr. Williams seems to overlook the fact that unless the frontier itself could be brought back, the inequalities inherent in a fully expanded industrialism would make for the most "unnatural" selection.

A different kind of society is envisaged by McGraw in *Let Babies Be Our Teachers*. In the babies whose development she has watched for many years one of her principal observations was a shift toward increased purposiveness in behavior as control shifted from subcortical centers to the cortex. She believes that "there are fundamental properties of growth, and that the same principles are at work whether it is the growth of a salamander embryo, the behavior of an infant, or a social system" (VIII, 116). She attempts to bridge the gap between individual and society by introducing the concept of "social cortex." When the social cortex takes control, new social systems will arise which will be purposive, recognizing the sovereignty of the global whole while at the same time granting "individuation" to the parts. Since this attractive theory is based on analogy alone, it can be only a hope rather than a necessary emergent.

In Gesell's *Genius, Giftedness and Growth*, we have a further emphasis on biological continuity. His thesis is that genius is a growth process not differing in kind from other growth processes. "Thought structures are just as real, just as somatic as crystals and fiber structures" (VII, 137). By the use of illustrations from the lives of such recognized geniuses as Coleridge and Darwin, he shows how their creative efforts depended on their whole previous development. He points out that while the mechanisms of genius are biological, it is up to society to make the best use of it. Just how society could get its geniuses under control and yet give them the necessary freedom in which to grow is left to the reader's ingenuity.

The "tough-minded" psychologist, taking it for granted that behavior must have a structural basis, is hardly prepared for dualism in the renowned Tracy Putnam. The evidence against specific cortical localizations of the intellectual

functions leads him to postulate a kind of Heisenberg principle in consciousness. "The most telling positive argument against the *conscious automaton* theory is the sense of purpose and significance which is almost universal in the human race" (VII, 62).

After this excursion into mysticism it is a relief to get down to earth and grapple with immediate social problems. In *Crime and Punishment*, the famous criminologist, Bernard Glueck, shows that the criminal problem reflects the confusion, insecurity and aggression of contemporary civilization and he anticipates increased difficulties during the postwar readjustment. He pleads for the replacement of the punitive by a psychiatric attitude in the interests of rehabilitating the criminal.

Some of the deepest insights into problems of social adjustment have come from the psychoanalysts. Brill gives a clear and sympathetic account of the development of Freud's system in *The Freudian Epoch*. From Hippocrates' diagnostic use of the dream to Freud's *Traumdeutung*, the chief milestones are reviewed. The discussion ends with a psychoanalytic interpretation of Freud himself in terms of his identification with Moses, the great liberator who had to face the prejudice and opposition of those whom he tried to free. Without belittling this excellent paper we may point out the need for a more objective, critical evaluation of the psychoanalytic movement for the layman.

According to Freud, war serves to drain off the accumulated hostilities of individuals and consequently is necessary for the preservation of internal peace. In *Aggressiveness—Individual and Collective*, another psychoanalyst, Franz Alexander, would limit the Freudian thesis to autocracies, where the individual suffers severe frustrations. In the democracies where independence and self-expression are encouraged, war cannot be rationalized in terms of human needs. He sees the prospect of permanent peace through the development of an international conscience under the guidance of an international federation.

The value of these lectures as a contribution to public enlightenment can hardly be overestimated. The only danger lies in the possible confusion of the layman by the doctors' disagreements as to how to cure our sick society. This danger can be avoided only if each contributor carefully distinguishes between fact and interpretation so as not to influence unduly lay opinion through medical prestige on questions that go beyond medical authority.

Looking ahead to future numbers in the series, one wonders if in the interests of building a better world, the New York Academy of Medicine might not give the benefit of the *March of Medicine* to the public in the fields of maternal health and sex education. And finally, could we as laymen, dare to suggest discussion of our greatest hope—socialized medicine?

GEORGENE H. SEWARD

Connecticut College

## BOOKS AND MATERIALS RECEIVED

BECK, S. J. *Rorschach's test. I. Basic processes.* New York: Grune and Stratton, 1944. Pp. xiii+223.

BERRIEN, F. K. *Practical psychology.* New York: Macmillan, 1944. Pp. v+584.

BUNGER, ANNA M. *Speech reading—Jena method.* (Rev. Ed.) Danville, Ill.: The Interstate Printers and Publishers, 1944. Pp. 136.

DEUTSCH, HELENE. *Psychology of women.* New York: Grune and Stratton, 1944. Pp. xiv+397.

GALLUP, G. *A guide to public opinion polls.* Princeton: Princeton Univ. Press, 1944. Pp. xviii+103.

HALL, J. K. et al. (Eds.) *One hundred years of American psychiatry.* New York: Columbia Univ. Press, 1944. Pp. xxiv+649.

KIRCHER, CLARA J. (Ed.). *Character formation through books: a bibliography.* Washington: Catholic Univ. of America, 1944. Pp. 79.

LINDNER, R. M. *Rebel without a cause: the hypnoanalysis of a criminal psychopath.* New York: Grune and Stratton, 1944. Pp. xiii+296.

MALINOWSKI, B. *A scientific theory of culture and other essays.* Chapel Hill: Univ. North Carolina Press, 1944. Pp. ix+228.

REIK, T. *A psychologist looks at love.* New York: Farrar and Rinehart, 1944. Pp. vii+300.

SELLING, L. S. *Murder, riot and statistical studies. Scientific reports from the Psychopathic Clinic of the Recorder's Court.* Publ. No. 2. Detroit: City Clerk, City Hall, 1944. Pp. 76.

SLADEN, F. J. *Psychiatry and the war: a survey of the significance of psychiatry and its relation to disturbances in human behavior to help provide for the present war effort and for post-war needs.* Springfield, Ill.: Charles C Thomas, 1944. Pp. xxii+505.

WECHSLER, D. *The measurement of adult intelligence* (3rd Ed.). Baltimore: Williams and Wilkins, 1944. Pp. vii+258.

YOUNG, K. *Social psychology* (2nd Ed.). New York: F. S. Crofts, 1944. Pp. vii+578.

## NOTES AND NEWS

EUGENE LERNER, professor of psychology, Sarah Lawrence College (Bronxville, N. Y.), died, Sept. 21, at the age of forty-three years. Dr. Lerner, who was born in Budapest, became an American citizen in 1927. He had done clinical work in child-guidance institutions in Brooklyn (N. Y.) and Newark (N. J.) before going to the department of psychology, Sarah Lawrence College, in 1936.

RAYMOND ROYCE WILLOUGHBY died on Oct. 3, at the age of forty-eight years. He is best known to psychologists as Associate Editor of the *Psychological Abstracts* (1926-40), and for his publications in the fields of social psychology, personality, and individual differences. Since 1940 he has been Chief of the Division of Research and Statistics in the (R.I.) State Department of Social Welfare.

FORREST H. KIRKPATRICK, dean of students, Bethany (W. Va.) College, who has been on leave serving as personnel administrator with the RCA Mfg. Co., has been appointed by Secretary Cordell Hull as consultant on personnel administration for the Department of State.

FREDERICK WYATT has been appointed psychologist at McLean Hospital, Waverley, Mass., while continuing as assistant psychologist at the Department of Neuropsychiatry of the Massachusetts General Hospital, and as special instructor in psychology at Simmons College.

SARA STINCHFIELD-HAWK of the department of psychology, University of Southern California, has been appointed as visiting associate professor of psychology at Scripps College (Claremont, California).

ANNA SPIESMAN STARR, professor of psychology in University College of Rutgers University (New Brunswick, N. J.), has been appointed director of the psychological and mental hygiene clinic at that institution.

JOHN G. PEATMAN, associate professor of psychology, City College, New York City, has been appointed associate dean.

FRANKLIN J. SHAW, formerly instructor in psychology at Bates College (Lewiston, Me.) has been appointed assistant professor of psychology at the University of New Hampshire.

New appointments to the staff of Centenary Junior College (Hackettstown, N. J.), include the appointment of ROBERT B. GARBER to the department of psychology.

LESLIE K. PATTON, professor of psychology and director of personnel, Coe College (Cedar Rapids, Iowa), has accepted a post with the USO.

FRANKLIN C. PASCHAL, dean, Junior College, and professor of psychology, Vanderbilt University, resigned on September 30.

DePauw University has announced the appointment of JOSEPH C. HESTON as director of the newly-created Bureau of Testing and Research. The Bureau is designed to afford a centralized university service for both routine group and individual tests in the areas of educational achievement, vocational guidance, and personality adjustment. Plans for more personalized student counseling

include faculty in-service training under the sponsorship of the Bureau. Dr. Heston will continue to teach clinical and applied courses in the psychology department.

At the invitation of the Department of State, six Chinese institutions have sent representatives to the United States for a year in order that contacts may be made between these distinguished scholars and American scholars and institutions. Among the visitors are DR. CHEN-SHENG YANG, formerly Acting Dean of the College of Arts and Literature at the National University of Peking, who studied education and psychology in this country from 1919-1923, and DR. GING-HSI WANG, Director of the Institute of Psychology of the Academia Sinica. Departments of psychology will be interested to know that invitations to the professors to lecture or take part in conferences may be issued through the China Section, Division of Cultural Cooperation, Department of State, Washington 25, D. C.

GING-HSI WANG, neuro-physiologist and head of the Institute of Psychology of the Academia Sinica, Kweilin, China, is spending a year in the United States at the invitation of the Department of State in connection with the Department's program of cultural relations with China. Dr. Wang received his Ph.D. degree from Johns Hopkins in 1923 and was an assistant and instructor in psychobiology in Johns Hopkins Medical School in the periods 1923-24 and 1925-27, respectively. He has been professor of psychology at: Chunchow University, 1924-25; National Sun Yat Sen University, 1927-31; and the National Peking University, 1931-34. Since 1934 he has been Director of the Institute of Psychology, Academia Sinica.

The 35th Annual Meeting of the National Committee for Mental Hygiene will be held on Wednesday and Thursday, Nov. 8 and 9, at the Hotel Pennsylvania in New York. Topics of the various sessions will include "Mental Hygiene of Industry and Reconversion"; "Rehabilitation and the Returning Veteran"; "Race Relations"; and "Services to the Mentally Ill Today." A luncheon session on Thursday, Nov. 9, will be devoted to the topic "Mental Hygiene Considerations in Peace Plans."

The Personnel Bureau of the University of Illinois has opened wide its doors to help any Illinois veteran in decisions about his vocation or education, and his personal or psychological problems.

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